

# Air monitoring report 2016 – Compliance with the National Environment Protection (Ambient Air Quality) Measure



Environment  
Protection  
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## Overview

This report presents the results of air quality monitoring in Victoria for the 2016 calendar year and assesses them against the requirements of the Ambient Air Quality National Environment Protection Measure<sup>1</sup> (the Measure). Environment Protection Authority Victoria (EPA) also updates data hourly on its website<sup>2</sup> and produces an annual air quality summary.

The Measure establishes:

- The requirements for air quality monitoring for carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), sulfur dioxide (SO<sub>2</sub>), particles as PM<sub>10</sub> (particles less than 10 µm in diameter), particles as PM<sub>2.5</sub> (particles less than 2.5 µm in diameter) and lead (Pb).
- Air quality standards that are concentrations over specified time periods of specified pollutants against which air quality can be assessed.
- A goal that the air quality standards be met to the extent specified in the Measure. Recognising that certain events can impact on air quality, the Measure specifies a maximum number of days on which it is permissible to exceed the standard.

On 25 February 2016, the Measure was varied to introduce a 25 µg/m<sup>3</sup> annual standard for PM<sub>10</sub>, a daily standard of 25 µg/m<sup>3</sup> for PM<sub>2.5</sub> and an 8 µg/m<sup>3</sup> annual standard for PM<sub>2.5</sub>. The varied Measure also removed the number of allowable exceedances for PM<sub>2.5</sub> and PM<sub>10</sub>.

In 2016, where sufficient data was captured, the goals were met at all stations except for PM<sub>10</sub> at Geelong South, and for PM<sub>2.5</sub> at Alphington, Footscray and Traralgon.

There were exceptions due to insufficient data capture for: PM<sub>10</sub> at Richmond due to the closure of the station; PM<sub>2.5</sub> at Geelong due to instrument issues; ozone at Brighton, Dandenong, Melton, Mooroolbark and Point Cook due to these stations being only operated during summer months when ozone forms, and; at Footscray, due to instrument issues. There was insufficient data capture for hourly sulfur dioxide at Geelong, however the daily capture was sufficient.

Victoria's air quality in 2016 was generally good. The major impacts on Victoria's air quality during the year were associated with PM<sub>10</sub> particles on five days in the Port Phillip Region. These events were attributed to either localised dust, regional dust or bushfires.

The goal for particles as PM<sub>10</sub> was exceeded at Geelong South, however it was met at other stations in this report.

The daily reporting standard for PM<sub>2.5</sub> was exceeded at Alphington and Footscray on two days in the Port Phillip region. One of the days was likely due to domestic wood heaters. The standard was also exceeded on one day at Traralgon in the Latrobe Valley and was likely due to planned fuel reduction burning. The annual reporting standard (8 µg/m<sup>3</sup>) for PM<sub>2.5</sub> was met at Alphington, Footscray, Geelong and Traralgon.

Separate to this report, issue-specific stations not included in the Measure are located at the Brooklyn industrial precinct and stations established in response to the Hazelwood inquiry in the Latrobe Valley. Particle levels at Brooklyn were generally higher than the nearby Footscray station due to impacts from local sources. Results for these stations are reported separately on EPA Victoria's website<sup>3</sup>.

Some regions do not require monitoring on the basis that screening shows pollutant levels are reasonably expected to be consistently below the relevant standards in the Measure. These regions are Ballarat, Bendigo, Shepparton, Warrnambool, Wodonga and Mildura.

Monitoring was performed in accordance with a modified form of Victoria's monitoring plan<sup>4</sup>, the Measure's Technical Papers and EPA's NATA accreditation. As of June 2016, work is being carried out to incorporate monitoring for PM<sub>2.5</sub> using beta attenuation monitors (BAM) as part of EPA Victoria's NATA accreditation.

<sup>1</sup> National Environment Protection Measure for Air Quality, National Environment Protection Council publication, available from <https://www.legislation.gov.au>

<sup>2</sup> EPA hourly data tables <http://www.epa.vic.gov.au>

<sup>3</sup> EPA publications <http://www.epa.vic.gov.au/our-work/publications>

<sup>4</sup> Ambient Air Quality NEPM Monitoring Plan Victoria, Environment Protection Authority Victoria publication 753, available from [www.epa.vic.gov.au/publications](http://www.epa.vic.gov.au/publications)



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## A Monitoring summary

### Current performance monitoring stations

Victoria's air monitoring plan for the Measure was approved by the National Environment Protection Council Ministers in February 2001. Data presented in this report has been produced in accordance with the monitoring plan, except where noted.

The Measure requires the monitoring of the pollutants carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), sulfur dioxide (SO<sub>2</sub>), particles less than 10 micrometres in diameter (PM<sub>10</sub>) and particles less than 2.5 micrometres in diameter (PM<sub>2.5</sub>), and lead (Pb) which is no longer monitored as levels have decreased significantly.

Eight regions are defined in the monitoring plan; these include: Port Phillip and Latrobe Valley regions, which have permanent performance monitoring stations. Ballarat, Bendigo, Shepparton, Warrnambool and Mildura, where campaign monitoring was previously conducted. Wodonga, where data from monitoring at Albury New South Wales has been used.

Stations at which monitoring was conducted in 2016 are shown in Figure 1 and Figure 2. The monitoring stations, pollutants monitored and site types are summarised in Table 1. Site types are defined as generally representative upper bound for community exposure sites and population-average sites.

### Description of exposed population

The exposed population represented by each monitoring station is described qualitatively by the location category column in

Table 1: Victorian performance monitoring stations

Region	Location category	Site type				
		CO	NO <sub>2</sub>	O <sub>3</sub>	SO <sub>2</sub>	PM <sub>10</sub>
<b>Performance monitoring station</b>						
<b>Port Phillip</b>						
Alphington	Residential / Light Industrial	G*	G*	Pop	Pop*	G*
Altona North <sup>d</sup>	Industrial / Residential				G	
Brighton	Residential		G	Pop*		Pop
Dandenong	Light Industrial			Pop		Pop
Footscray	Industrial / Residential		G*	G*		G*
Geelong South	Light Industrial / Residential	G*	G*	Pop*	G*	G*
Melton	Residential			G		
Mooroolbark	Residential			Pop		Pop
Point Cook	Rural / Residential		Pop*	G*		
Point Henry <sup>c</sup>	Industrial / Rural			Pop		
Richmond	Residential	G				G
RMIT (CBD) <sup>a</sup>	CBD	G*	G*		G	G*
<b>Latrobe Valley</b>						
Moe <sup>b</sup>	Residential		Pop	G	G	G
Traralgon	Residential		G*	G*	G*	G*

\* Trend Station

G Generally representative upper bound

Pop Population average

Table 1. Further information is given in Appendix C of the monitoring plan<sup>5</sup>.

### Implementation of the monitoring plan

Victoria's air quality monitoring program is continually examined and options for current and future monitoring are considered yearly, depending on needs and the finds of reviews.

The peak station for lead, in Collingwood, was closed in December 2004 because levels were so low compared to the air quality objective. This change to Victoria's monitoring plan was approved in accordance with procedures outlined in the Measure.

The station at Paisley was renamed Altona North in June 2006 to better reflect its geographic location.

Monitoring ceased at the CBD station (at RMIT University) in October 2006, when the lease was terminated due to building extensions.

The station at Moe was closed in October 2009 when the lease was terminated due to building construction works, and following a review which found the Traralgon station was comparable to Moe and representative of Latrobe Valley.

Ozone monitoring was stopped at Point Henry in March 2011 as the Point Henry site was not representative of the general area. Monitoring ceased at the CBD station (at Richmond) in 2016, when the lease was terminated. A replacement station in the Melbourne CBD is being established during 2017.

Regions that do not require monitoring on the basis that previous screening monitoring showed that pollutant levels were reasonably expected to be consistently below the relevant standards in the Measure are Ballarat, Bendigo, Shepparton, Warrnambool, Wodonga and Mildura.

5 Ambient Air Quality NEPM Monitoring Plan Victoria, Environment Protection Authority Victoria publication 753, available from [www.epa.vic.gov.au/publications](http://www.epa.vic.gov.au/publications)

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- a RMIT station closed in 2006
- b Moe closed in 2009, monitoring for PM<sub>2.5</sub> (beta attenuation started in 2015)
- c Point Henry closed in 2011
- d SO<sub>2</sub> monitoring ceased in 2015
- e Richmond station closed in 2016

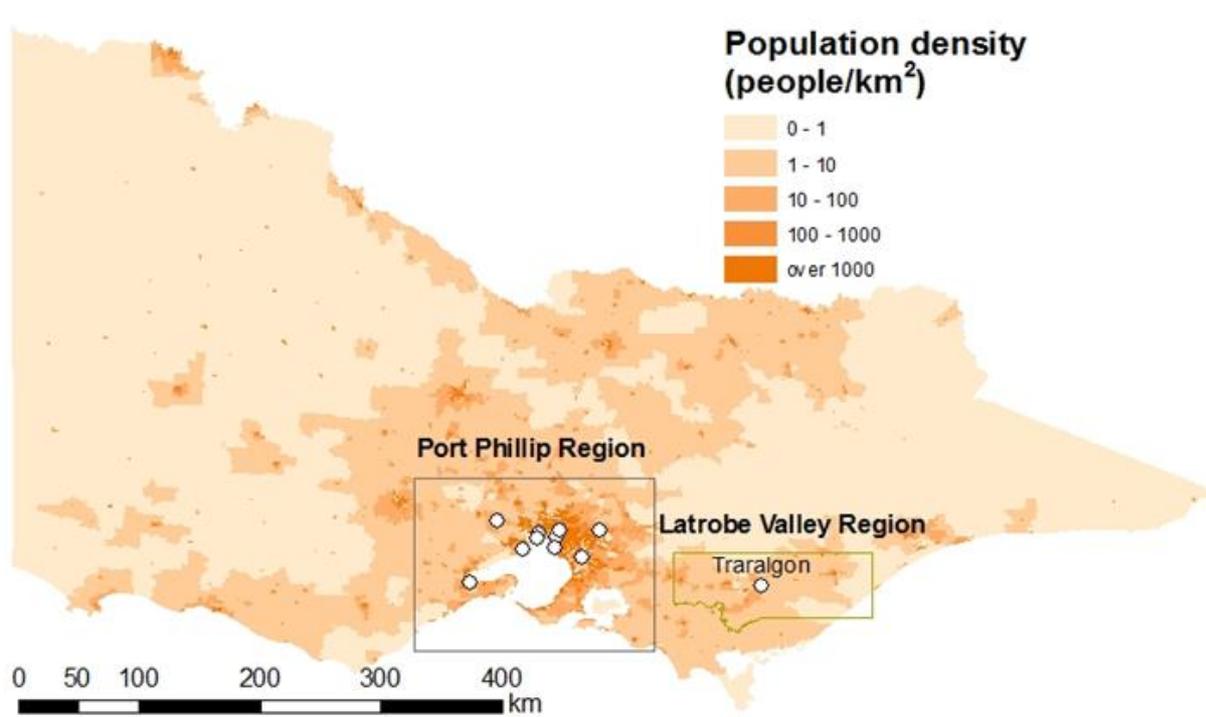


Figure 1: Defined regions and population density in Victoria

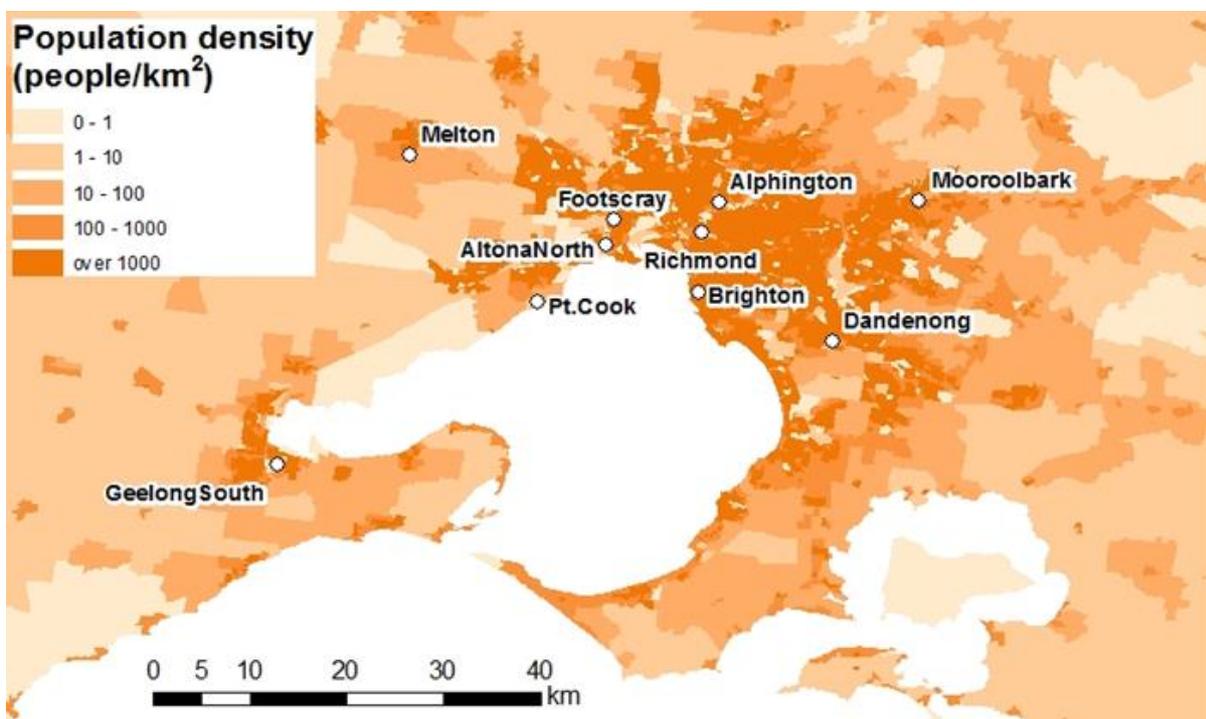


Figure 2: Monitoring stations and population density in Port Phillip region

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Table 2: Summary of stations' siting compliance with AS 3580.1.1-2016

Region Station	Height above ground	Minimum distance to support structure	Clear sky angle of 120°	Unrestricted airflow of 270°/360°	20 m from trees	No boilers or incinerators nearby	Minimum distance from road or traffic
<b>Port Phillip</b>							
Alphington	Y	Y	Y	Y	N	Y	N
Altona North	Y	Y	Y	Y	Y	Y	N
Brighton	Y	Y	Y	Y	Y	Y	N
Dandenong	Y	Y	Y	Y	Y	Y	N
Footscray	Y	Y	Y	Y	Y	Y	Y
Geelong South	Y	Y	Y	Y	Y	Y	N
Melton	Y	Y	Y	Y	Y	Y	N
Mooroolbark	Y	Y	Y	Y	Y	Y	N
Point Cook	Y	Y	Y	Y	Y	Y	N
Richmond	Y	Y	Y	Y	Y	Y	N
<b>Latrobe Valley</b>							
Traralgon	Y	Y	Y	Y	N	Y	N
Moe	Y	Y	Y	Y	N	Y	N

## Monitoring methods

Victorian monitoring is conducted in accordance with the Australian Standard as shown in Table 3. Data not meeting the requirements of these Standards and EPA's quality assurance procedures was identified as invalid and not included in reporting.

TEOM PM<sub>10</sub> data included in this report has been adjusted according to the approved procedure as outlined in *Technical Paper No. 10 – Collection and Reporting of TEOM PM<sub>10</sub> Data*<sup>6</sup>, using the temperature-dependent formula with a constant value of K equal to 0.04.

The resulting adjustments vary from no change at daily average temperatures at or above 15 °C, to an increase of 40 per cent at a temperature of 5 °C. Particle concentration units of µg/m<sup>3</sup> refer to volumes at 0 °C and one atmosphere of pressure.

6 Former Standing Council on Environment and Water (incorporating the National Environment Protection Council)  
<http://www.scew.gov.au>

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Table 3: Methods for monitoring pollutants in the Measure

Pollutant		Applicable Standard "Title of Standard"	Method used
Carbon monoxide	CO	Australian Standard 3580.7.1-2011 "Ambient air – Determination of carbon monoxide, direct instrumental method"	Gas filter correlation/infrared
Nitrogen dioxide	NO <sub>2</sub>	Australian Standard 3580.5.1-2011 "Ambient air – Determination of oxides of nitrogen —Direct reading instrument method"	Gas phase chemiluminescence
Photochemical oxidant (ozone)	O <sub>3</sub>	Australia Standard 3580.6.1-2016 "Ambient air – Determination of ozone — Direct reading instrument method"	Non-dispersive ultraviolet
Sulfur dioxide	SO <sub>2</sub>	Australian Standard 3580.4.1-2008 "Ambient air – Determination of sulfur dioxide — Direct reading instrument method"	Pulsed fluorescence
Particles	PM <sub>10</sub>	Australian Standard 3580.9.8-2008 "Determination of suspended particulate matter – PM <sub>10</sub> continuous direct mass method using a tapered element oscillating microbalance analyser"	Tapered element oscillating microbalance (TEOM)
	PM <sub>2.5</sub>	Australian Standard 3580.9.10-2006 "Determination of suspended particulate matter – PM <sub>2.5</sub> low volume sampler – Gravimetric method"	Gravimetric reference method
		Australian Standard 3580.9.12:2013 Determination of suspended particulate matter PM <sub>2.5</sub> beta attenuation monitors	Beta Attenuation monitors

## NATA status

All methods currently used by EPA for performance monitoring are covered by its National Association of Testing Authorities (NATA) accreditation (Number 15119) except for PM<sub>2.5</sub> using BAMs. Work is being carried out to incorporate monitoring for PM<sub>2.5</sub> using BAMs as part of EPA Victoria's NATA accreditation. Conformance or non-conformance of the siting of particular performance monitoring stations is noted within this report. EPA was successfully reaccredited in 2016.

As of February 2016, monitoring for PM<sub>10</sub> and PM<sub>2.5</sub> using the Hivol and Partisol manual methods are performed for EPA by Golder Associates under its NATA accreditation (Number 1910).

Victoria monitors PM<sub>2.5</sub> by the reference method specified in the Measure (on a one-day-in-three basis) at two stations (Alphington and Footscray). It also monitors PM<sub>2.5</sub> continuously at these two stations using BAMs.

Prior to this, Victoria also participated in the PM<sub>2.5</sub> Equivalence Program, with TEOM monitors located at Alphington and Footscray. Alphington was substituted for Mooroolbark, which was originally proposed. TEOM PM<sub>2.5</sub> readings are taken with the inbuilt adjustment for PM<sub>10</sub> removed (A and B constants set to 0 and 1) and no adjustment for loss of volatiles.

## Screening procedure

The monitoring plan outlines how to demonstrate whether levels of pollutants are consistently below the standards. If screen procedures are satisfied, monitoring may not be required, or may be conducted at fewer locations. Screening procedures conducted in accordance with the Measure have been satisfied for Victorian regions, except for PM<sub>10</sub>, at Ballarat, Bendigo, Mildura, Shepparton, Wodonga and Warrnambool. Additional information can be found in the following reports.

- [Air monitoring at Warrnambool, October 2006 to October 2007](#)
- [Airborne particle monitoring at Mildura, December 2004 to June 2006](#)
- [Air monitoring at Ballarat August 2005 to August 2006](#)
- [Air monitoring at Bendigo, May 2004 to July 2005](#)
- [Airborne particle monitoring at Shepparton, December 2003 to December 2004](#)

## PM<sub>2.5</sub> monitoring

On 25 February 2016, the Measure was varied to introduce a daily standard of 25 µg/m<sup>3</sup> for PM<sub>2.5</sub> and an 8 µg/m<sup>3</sup> annual standard for PM<sub>2.5</sub>. The varied Measure also removed the number of allowable exceedances for PM<sub>2.5</sub> and PM<sub>10</sub>.

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## B Assessment of compliance with standards and goals

Air quality is assessed against the standards defined in the Measure and the associated goals shown in Table 4. Standards are concentrations, in parts per million (ppm) or micrograms per cubic metre ( $\mu\text{g}/\text{m}^3$ ), against which air quality can be assessed.

The goal of the Measure is to achieve the National Environment Protection Standards as assessed in accordance with the monitoring protocol to the extent specified in Schedule 2 of the Measure. The extent is expressed as a maximum allowable number of exceedances for each standard (shown in column four of Table 4). For  $\text{PM}_{2.5}$ , there is an additional goal to further reduce concentrations to below a daily concentration of  $20 \mu\text{g}/\text{m}^3$  and an annual concentration of  $7 \mu\text{g}/\text{m}^3$  by 2025.

The number of allowable exceedances associated with the standards has been set to account for unusual meteorological conditions and, in the case of particles, exceptional events such

as bushfires, jurisdiction authorised hazard reduction burning or continental scale windblown dust that cannot be controlled through normal air quality management strategies. Air quality monitoring data from each monitoring site is assessed against these standards and the associated goals.

Air quality is assessed as complying with the Measure if the number of exceedances of the standard is no more than the number specified in Schedule 2 of the Measure and data availability was at least 75 per cent in each quarter of the year.

Regions also meet the standards and goal if they do not require monitoring on the basis that screening shows pollutant levels are reasonably expected to be consistently below the relevant standards.

Air quality is assessed as 'not demonstrated' if there has been insufficient data collected to demonstrate that the standards and goal have been met or not met. Regions may also be assessed as 'not demonstrated' if screening has not been completed.

Table 4: Air quality standards and goals in the Measure

Pollutant	Averaging period	Standard	Goal max. allowable exceedances
Carbon monoxide	8 hours	9.0 ppm	1 day a year
Nitrogen dioxide	1 hour	0.12 ppm	1 day a year
	1 year	0.03 ppm	None allowed
Ozone	1 hour	0.10 ppm	1 day a year
	4 hours	0.08 ppm	1 day a year
Sulfur dioxide	1 hour	0.20 ppm	1 day a year
	1 day	0.08 ppm	1 day a year
	1 year	0.02 ppm	None
Particles as $\text{PM}_{10}$	1 day	$50 \mu\text{g}/\text{m}^3$	None
	1 year	$25 \mu\text{g}/\text{m}^3$	None
Particles as $\text{PM}_{2.5}$	1 day	$25 \mu\text{g}/\text{m}^3$	None
	1 year	$8 \mu\text{g}/\text{m}^3$	None
Lead	1 year	$0.50 \mu\text{g}/\text{m}^3$	None

## C Summary of progress towards achieving the goals of the Measure

The Measure's goals for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, PM<sub>10</sub>, PM<sub>2.5</sub> and lead are to be below the standards within the extent specified, taking into consideration the allowed number of exceedances, as shown in Table 4.

### Compliance in 2016

In 2016, where there was sufficient data captured, the goals were met at all stations except for PM<sub>10</sub> at Geelong South, and for PM<sub>2.5</sub> at Alphington, Footscray and Traralgon.

The exception due to insufficient data capture was PM<sub>10</sub> at Richmond due to the closure of the station, for PM<sub>2.5</sub> at Geelong due to instrument issues, for ozone at Brighton, Dandenong, Melton, Mooroolbark and Point Cook due to these stations being only operated during summer months when ozone forms, and at Footscray due to instrument issues.

Carbon monoxide concentrations were well within the standard at all stations. The highest reading occurred at Alphington, where carbon monoxide reached 23.3 per cent of the standard.

The one-hour standard for nitrogen dioxide was met at all stations during 2016 where there was sufficient data captured. The highest one-hour average in the Port Phillip region, at Footscray was 36.6 per cent of the standard and in the Latrobe Valley, at Traralgon, 38.3 per cent of the standard.

The one-hour and four-hour standards for ozone were met at all stations during 2016 where there was sufficient data captured. The highest one-hour average in the Port Phillip region, at Point Cook, was 79 per cent of the standard and in the Latrobe Valley, at Traralgon, 68 per cent of the standard.

The one-hour and daily standards for sulfur dioxide were met at all stations during 2016 where there was sufficient data captured. The highest one-hour average in the Port Phillip region, at Altona North, was 20.5 per cent of the standard and in the Latrobe Valley, at Traralgon, 28.5 per cent of the standard. The highest daily average in the Port Phillip region at Altona North, was 16.3 per cent of the standard and in the Latrobe Valley, at Traralgon, 7.5 per cent of the standard.

The highest daily average for PM<sub>10</sub> in the Port Phillip region, at Geelong South was 136.6 per cent of the standard. The high concentrations of localised dust have been attributed to an unsealed carpark and high levels of vehicle movement associated with the Geelong races. The highest daily average for PM<sub>10</sub> in the Latrobe Valley, at Traralgon was 98.4 per cent of the standard.

The highest annual average for PM<sub>10</sub> in the Port Phillip region, at Geelong South was 63.6 per cent of the standard and in the Latrobe Valley, at Traralgon was 56 per cent of the standard.

The highest daily average for PM<sub>2.5</sub> in the Port Phillip region, at Alphington was 134.4 per cent of the standard recorded using the Beta Attenuation method. The highest annual average for PM<sub>2.5</sub> was recorded at Alphington and was 92.5 per cent of the standard and was recorded using the Partisol method.

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## D Carbon monoxide (CO)

### Assessment of compliance with standards and goals of the Measure for carbon monoxide

In Victoria, carbon monoxide is assessed against an 8-hour standard of 9.0 ppm, with one exceedance day allowed per year.

Table 5: 2016 compliance summary for carbon monoxide in Victoria

Region Performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Performance against the standard and goals
	Q1	Q2	Q3	Q4	Annual		
<b>Port Phillip</b>							
Alphington	99.4	97.1	84.8	93.8	93.7	0	MET
Footscray	88.7	99.1	97.1	96.0	95.2	0	MET
Geelong South	98.2	93.0	98.6	89.7	94.9	0	MET

The carbon monoxide standard was not exceeded and compliance was demonstrated at all stations. Footscray was added as a performance monitoring station for 2016.

### Analysis of air quality monitoring for carbon monoxide

Carbon monoxide concentrations were well within the standard at all stations. The highest reading occurred at Alphington, where carbon monoxide reached 23.3 per cent of the standard.

Table 6: 2016 summary statistics for daily peak eight-hour carbon monoxide in Victoria

Region Performance monitoring station	Number of valid days	Highest reading (ppm)	Highest reading (date: hour)	2nd highest reading (ppm)	2nd highest reading (date:hour)
<b>Port Phillip</b>					
Alphington	330	2.1	Jun 02:02	1.6	Jun 01:23
Footscray	342	1.3	Nov 14:16	0.9	Jun 01:01
Geelong South	338	1.7	Jan 28:11	1	Jun 01:01

Table 7: 2016 percentiles for daily peak eight-hour carbon monoxide in Victoria

Region Performance monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm)					
			99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
Alphington	90.2	2.1	1.3	1.2	0.9	0.8	0.5	0.3
Footscray	93.4	1.3	0.7	0.7	0.6	0.5	0.3	0.2
Geelong South	92.3	1.7	0.8	0.8	0.6	0.4	0.3	0.2

### Trends and pollutant distributions for carbon monoxide between 2002 and 2016

Percentiles of 2016 daily peak concentrations are provided for each station and standard. In these tables, daily peak values are formed only when at least 75 per cent of the data for the day are valid. Data for stations with less than 15 per cent data in the year are omitted and stations with less than 75 per cent data are shown in italics. Exceedances are shown in bold. The percentiles for eight-hour carbon monoxide and four-hour ozone are based on running averages, including those that overlap from one day to the next.

Percentiles of the daily peak concentrations in Port Phillip Region (PPR) are plotted from 2002, when monitoring according to the Measure's protocol ensured greater continuity of stations operating each year. The values plotted are averages of the percentiles from stations having at least 75 per cent of data in the year. Different stations and different statistics can suggest different trend behaviour; no estimates of statistical significance are presented.

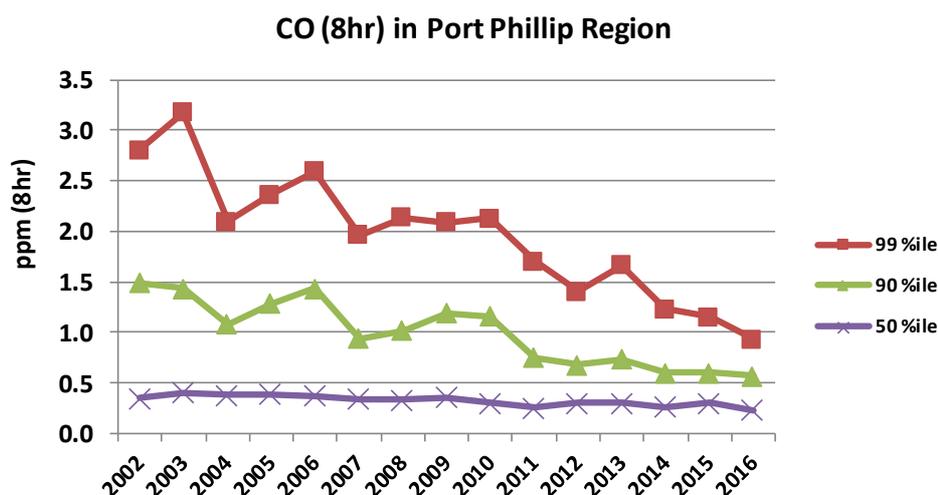


Figure 3: Percentiles of daily maximum carbon monoxide (average of Port Phillip stations 2002–2016)

In interpreting trends, it should be noted that monitoring at RMIT ceased in October 2006 and at Richmond in March 2015. This CBD station tended to record higher carbon monoxide levels, so averages in later years may be relatively lower.

Table 8: Percentiles of daily maximum eight-hour carbon monoxide at Alphington (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup> (ppm)	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	93.7	0	3.8	3.5	3.1	2.7	2.0	0.9	0.4
2003	96.7	0	5.4	3.9	3.5	2.7	1.8	0.9	0.5
2004	97.0	0	3.7	2.4	2.3	1.7	1.3	0.8	0.5
2005	93.7	0	3.1	2.5	2.4	2.0	1.6	0.9	0.6
2006	89.6	0	3.6	3.2	3.0	2.5	1.9	1.0	0.6
2007	98.6	0	2.8	2.3	1.9	1.6	1.2	0.8	0.5
2008	98.4	0	3.2	2.7	2.3	1.7	1.4	0.8	0.4
2009	97.5	0	2.6	2.1	2.0	1.8	1.3	0.7	0.3
2010	97.5	0	2.8	2.4	2.1	1.8	1.4	0.4	0.1
2011	95.1	0	2.9	1.8	1.6	1.2	0.8	0.3	0.1
2012 <sup>a</sup>	32.8	0	1.6	1.5	1.3	1.1	0.9	0.5	0.2
2013	83.8	0	2.6	2.1	1.9	1.5	1.1	0.7	0.4
2014	94	0	1.7	1.4	1.2	1.0	0.8	0.6	0.4
2015	93.7	0	1.7	1.5	1.3	1.0	0.8	0.5	0.4
2016	90.2	0	2.1	1.3	1.2	0.9	0.8	0.5	0.3

a: data availability between 15 and 75 per cent, values displayed in italics

Table 9: Percentiles of daily maximum eight-hour carbon monoxide at Footscray (2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2016	93.4	0	1.3	0.7	0.7	0.6	0.5	0.3	0.2

Table 10: Percentiles of daily maximum eight-hour carbon monoxide at Geelong (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	87.1	0	2.3	1.8	1.4	1.0	0.6	0.3	0.1
2003	87.1	0	3.2	1.8	1.6	1.1	0.7	0.4	0.2
2004	85.8	0	2.9 <sup>a</sup>	1.7	1.6	0.9	0.6	0.4	0.1
2005	96.4	0	3.5	1.8	1.5	0.9	0.7	0.2	0.1

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Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2006	92.3	0	2.2	1.9	1.6	1.2	0.7	0.3	0.1
2007	98.1	0	1.9	1.3	1.1	0.7	0.6	0.4	0.2
2008	94.5	0	2.2	1.8	1.6	1.0	0.5	0.3	0.2
2009	98.6	0	2.6	1.6	1.2	1.0	0.7	0.4	0.3
2010	98.1	0	1.8	1.3	1.2	0.8	0.7	0.5	0.3
2011	98.1	0	2.1	1.5	1.1	0.7	0.6	0.4	0.3
2012	97.8	0	1.7	1.2	0.9	0.8	0.6	0.4	0.3
2013	97.8	0	1.5	1.2	1.0	0.6	0.4	0.3	0.2
2014	100.0	0	1.4	1.0	0.8	0.6	0.4	0.2	0.1
2015	98.4	0	1.1	0.8	0.7	0.5	0.4	0.2	0.2
2016	92.3	0	1.7	0.8	0.8	0.6	0.4	0.3	0.2

a Recorded on a day with less than 75 per cent of valid eight-hour averages

Table 11: Percentiles of daily maximum eight-hour carbon monoxide at Richmond (2002-2015)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	93.2	0	5.0	3.1	2.8	2.4	1.9	0.8	0.3
2003	96.4	0	6.4	4.0	3.6	2.6	1.7	0.8	0.3
2004	96.2	0	3.9	2.4	2.2	1.8	1.2	0.6	0.3
2005	96.2	0	3.8	3.1	2.8	2.2	1.5	0.6	0.2
2006	95.3	0	3.2	2.9	2.8	2.3	1.7	0.7	0.3
2007	97.3	0	2.9	2.3	1.9	1.5	1.0	0.5	0.3
2008	95.4	0	3.7	1.9	1.6	1.5	1.2	0.6	0.4
2009	95.3	0	3.0	2.5	2.3	2.0	1.5	0.8	0.5
2010	94.0	0	3.2	2.7	1.9	1.6	1.4	0.7	0.5
2011	87.4	0	2.6	1.8	1.5	1.2	0.9	0.6	0.4
2012	95.9	0	2.2	1.6	1.5	1.1	0.8	0.4	0.3
2013	98.9	0	2.4	1.7	1.6	1.1	0.7	0.5	0.3
2014	100.0	0	1.6	1.3	1.0	0.8	0.6	0.4	0.3
2015 <sup>a</sup>	19.5 <sup>a</sup>	0	0.5	0.4	0.4	0.4	0.3	0.3	0.3

a: data availability between 15 and 75 per cent, values displayed in italics

Note: monitoring stopped in 2015

Table 12: Historical percentiles of daily maximum eight-hour carbon monoxide at RMIT (2002-2006)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	85.2	0	3.2	2.9	2.7	1.8	1.5	0.9	0.5
2003	96.7	0	3.9	3.0	2.6	1.8	1.5	0.9	0.6
2004	91.5	0	2.1	1.9	1.8	1.5	1.2	0.8	0.6
2005	95.3	0	2.4	2.1	2.0	1.7	1.3	0.9	0.6
2006	77.0	0	2.9	2.5	2.0	1.7	1.5	1.0	0.6

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## E Nitrogen dioxide (NO<sub>2</sub>)

### Assessment of compliance with standards and goals of the Measure for nitrogen dioxide

In Victoria, nitrogen dioxide is assessed against a 1-hour standard of 0.12 ppm, with one exceedance day allowed per year and an annual standard of 0.030 ppm, with no exceedances allowed.

Table 13: 2016 compliance summary for nitrogen dioxide in Victoria

Region Performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Annual mean (ppm)	Performance against the standard and goals	
	Q1	Q2	Q3	Q4	Annual			1 hour	Annual
<b>Port Phillip</b>									
Alphington	95.8	93.4	84.6	92.2	91.5	0	0.009	MET	MET
Footscray	96.2	95.2	93.0	84.1	92.1	0	0.010	MET	MET
Geelong South	90.3	94.8	94.8	92.3	93.0	0	0.006	MET	MET
<b>Latrobe Valley</b>									
Traralgon	96.6	93.2	92.1	62.7	86.1	0	0.007	MET	MET

At all stations operated during 2016, the nitrogen dioxide standard was not exceeded and compliance was demonstrated.

### Analysis of air quality monitoring for nitrogen dioxide

The one-hour standard for nitrogen dioxide was met at all stations during 2016 where there was sufficient data captured. The highest one-hour average in the Port Phillip region, at Footscray was 36.6 per cent of the standard and in the Latrobe Valley, at Traralgon, 38.3 per cent of the standard.

Table 14: 2016 summary statistics for peak one-hour nitrogen dioxide in Victoria

Region Performance monitoring station	Number of valid days	Highest reading (ppm)	Highest reading (date: hour)	2 <sup>nd</sup> highest reading (ppm)	2 <sup>nd</sup> highest reading (date:hour)
<b>Port Phillip</b>					
Alphington	335	0.043	Oct 09:21	0.042	Apr 13:20
Footscray	348	0.027	Feb 23:08	0.025	Jan 08:08
Geelong South	349	0.044	Nov 18:21	0.041	Jun 15:13
<b>Latrobe Valley</b>					
Traralgon	317	0.046	Jun 29:19	0.042	Feb 21:21 Apr 13:19

Table 15: 2016 percentiles for daily peak one-hour nitrogen dioxide in Victoria

Region Performance monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm)					
			99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
Alphington	91.5	0.043	0.038	0.036	0.031	0.029	0.023	0.018
Footscray	95.1	0.052	0.042	0.038	0.035	0.032	0.026	0.020
Geelong South	95.4	0.044	0.037	0.031	0.028	0.025	0.021	0.014
<b>Latrobe Valley</b>								
Traralgon	86.6	0.036	0.033	0.030	0.027	0.024	0.020	0.014

### Trends and pollutant distributions for nitrogen dioxide between 2002 and 2016

Results and further analysis of the monitoring data are presented in this section. Percentiles of 2016 daily peak concentrations are provided for each station and standard. In these tables, daily peak values are formed only when at least 75 per cent of the data for the day are valid. Data for stations with less than 15 per cent data in the year are omitted and stations with less than 75 per cent data are shown in italics. Exceedances are shown in bold. The percentiles for eight-hour carbon monoxide and four-hour ozone are based on running averages, including those that overlap from one day to the next.

Percentiles of the daily peak concentrations in Port Phillip Region are plotted from 2002, when monitoring according to the Measure's protocol ensured greater continuity of stations operating each year. The values plotted are averages of the percentiles from stations having at least 75 per cent of data in the year. Different stations and different statistics can suggest different trend behaviour; no estimates of statistical significance are presented.

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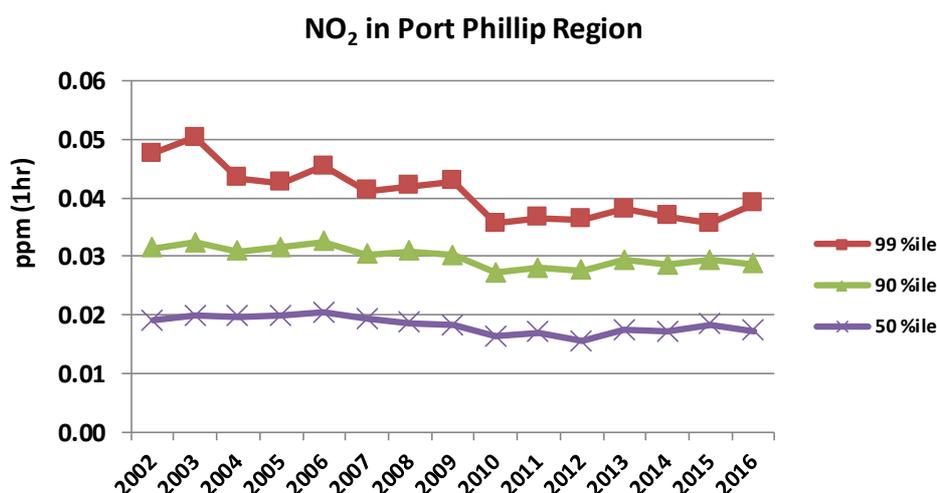


Figure 4: Percentiles of daily maximum nitrogen dioxide (average of Port Phillip stations 2002–2016)

Table 16: Percentiles of daily maximum one-hour nitrogen dioxide at Alphington (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	93.7	0	0.060	0.048	0.046	0.038	0.034	0.030	0.023
2003	90.1	0	0.065	0.050	0.046	0.037	0.032	0.027	0.023
2004	95.6	0	0.056	0.044	0.039	0.034	0.032	0.028	0.023
2005	94.8	0	0.050	0.043	0.039	0.035	0.033	0.027	0.022
2006	90.7	0	0.069	0.044	0.042	0.038	0.034	0.030	0.024
2007	100.0	0	0.052	0.046	0.039	0.035	0.033	0.029	0.024
2008	97.8	0	0.060	0.043	0.039	0.035	0.032	0.028	0.022
2009	98.4	0	0.051	0.043	0.042	0.035	0.031	0.026	0.020
2010	98.4	0	0.038	0.034	0.034	0.031	0.028	0.024	0.019
2011	96.2	0	0.046	0.040	0.035	0.031	0.029	0.026	0.021
2012 <sup>a</sup>	33.1	0	0.037	0.036	0.033	0.030	0.028	0.025	0.021
2013	84.4	0	0.046	0.039	0.037	0.035	0.032	0.027	0.022
2014	90.7	0	0.064	0.039	0.037	0.032	0.030	0.026	0.020
2015	93.4	0	0.043	0.035	0.033	0.032	0.030	0.025	0.021
2016	91.5	0	0.043	0.038	0.036	0.031	0.029	0.023	0.018

a: data availability between 15 and 75 per cent, values displayed in italics

Table 17: Percentiles of daily maximum one-hour nitrogen dioxide at Brighton (2002-2015)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	94.8	0	0.053	0.049	0.044	0.038	0.033	0.028	0.021
2003	98.1	0	0.074	0.053	0.045	0.037	0.033	0.027	0.021
2004	96.4	0	0.049	0.042	0.039	0.035	0.031	0.025	0.019
2005	99.2	0	0.054	0.040	0.038	0.034	0.032	0.027	0.020
2006	94.0	0	0.052	0.045	0.040	0.036	0.032	0.026	0.019
2007	99.7	0	0.048	0.040	0.038	0.034	0.032	0.026	0.020
2008	98.9	0	0.053	0.042	0.039	0.035	0.033	0.027	0.021
2009	97.0	0	0.049	0.041	0.038	0.034	0.031	0.026	0.020
2010	99.7	0	0.045	0.036	0.035	0.032	0.029	0.024	0.018
2011	99.2	0	0.042	0.035	0.034	0.032	0.030	0.025	0.018
2012	98.4	0	0.041	0.035	0.034	0.031	0.029	0.024	0.017
2013	98.9	0	0.042	0.038	0.037	0.033	0.031	0.025	0.019
2014	95.9	0	0.044	0.038	0.036	0.033	0.030	0.025	0.019
2015 <sup>a</sup>	15.6	0	0.27	0.026	0.025	0.023	0.019	0.016	0.011

a: data availability between 15 and 75 per cent, values displayed in italics

Note: monitoring stopped in 2015

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Table 18: Percentiles of daily maximum one-hour nitrogen dioxide at Footscray (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	91.8	0	0.059	0.055	0.049	0.040	0.035	0.029	0.022
2003	97.8	0	0.065	0.058	0.054	0.044	0.037	0.029	0.022
2004	95.6	0	0.056	0.047	0.044	0.040	0.035	0.029	0.023
2005	99.5	0	0.053	0.046	0.043	0.038	0.034	0.027	0.021
2006	87.7	0	0.071	0.051	0.046	0.040	0.034	0.028	0.022
2007	99.7	0	0.056	0.050	0.045	0.038	0.035	0.030	0.025
2008	100.0	0	0.064	0.048	0.045	0.038	0.034	0.029	0.022
2009	99.5	0	0.064	0.052	0.047	0.041	0.036	0.029	0.023
2010	99.7	0	0.062	0.045	0.043	0.036	0.032	0.026	0.020
2011	96.7	0	0.053	0.044	0.038	0.035	0.032	0.027	0.021
2012	89.3	0	0.058	0.042	0.040	0.036	0.032	0.027	0.020
2013	83.6	0	0.051	0.045	0.040	0.037	0.035	0.028	0.022
2014	97.3	0	0.064	0.045	0.040	0.036	0.033	0.027	0.021
2015	98.6	0	0.046	0.040	0.038	0.035	0.032	0.028	0.021
2016	95.1	0	0.052	0.042	0.038	0.035	0.032	0.026	0.020

Table 19: Percentiles of daily maximum one-hour nitrogen dioxide at Geelong South (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	94.2	0	0.056	0.036	0.031	0.027	0.025	0.019	0.012
2003	87.7	0	0.050	0.034	0.033	0.028	0.025	0.021	0.014
2004	93.2	0	0.050	0.037	0.030	0.027	0.024	0.020	0.015
2005	98.1	0	0.048	0.038	0.034	0.029	0.026	0.021	0.015
2006	92.9	0	0.043	0.036	0.034	0.028	0.026	0.022	0.016
2007	99.7	0	0.037	0.032	0.030	0.028	0.026	0.022	0.015
2008	99.5	0	0.052	0.039	0.033	0.029	0.027	0.021	0.015
2009	97.8	0	0.048	0.036	0.032	0.028	0.025	0.021	0.014
2010	98.6	0	0.039	0.029	0.028	0.025	0.023	0.020	0.013
2011	99.7	0	0.040	0.031	0.030	0.028	0.025	0.020	0.013
2012	94.3	0	0.041	0.032	0.031	0.028	0.026	0.020	0.014
2013	98.9	0	0.064	0.033	0.030	0.027	0.023	0.018	0.012
2014	99.5	0	0.036	0.030	0.029	0.027	0.025	0.019	0.014
2015	91.0	0	0.038	0.032	0.031	0.028	0.026	0.020	0.013
2016	95.4	0	0.044	0.037	0.031	0.028	0.025	0.021	0.014

Table 20: Percentiles of daily maximum one-hour nitrogen dioxide at Point Cook (2002-2015)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	96.2	0	0.056	0.045	0.041	0.031	0.027	0.021	0.013
2003	93.2	0	0.064	0.048	0.044	0.031	0.028	0.020	0.013
2004	94.8	0	0.066	0.041	0.035	0.030	0.026	0.020	0.013
2005	96.7	0	0.043	0.039	0.037	0.032	0.027	0.021	0.014
2006	89.6	0	0.049	0.047	0.043	0.033	0.028	0.022	0.014
2007	97.0	0	0.046	0.038	0.034	0.029	0.025	0.020	0.013
2008	99.7	0	0.065	0.037	0.035	0.032	0.028	0.020	0.013
2009	98.1	0	0.055	0.041	0.036	0.032	0.028	0.021	0.014
2010	89.3	0	0.037	0.033	0.032	0.027	0.024	0.019	0.012
2011	91.2	0	0.038	0.033	0.031	0.027	0.024	0.019	0.012
2012	95.9	0	0.039	0.036	0.033	0.027	0.024	0.017	0.011
2013	95.3	0	0.044	0.035	0.033	0.030	0.026	0.020	0.012
2014	98.9	0	0.044	0.032	0.031	0.028	0.025	0.020	0.012
2015 <sup>a</sup>	22.2	0	0.023	0.022	0.021	0.020	0.018	0.014	0.009

a: data availability between 15 and 75 per cent, values displayed in italics

Note: monitoring stopped in 2015

Table 21: Historical percentiles of daily maximum one-hour nitrogen dioxide at RMIT (2002-2006)

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Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	85.2	0	3.2	2.9	2.7	1.8	1.5	0.9	0.5
2003	96.7	0	3.9	3.0	2.6	1.8	1.5	0.9	0.6
2004	91.5	0	2.1	1.9	1.8	1.5	1.2	0.8	0.6
2005	95.3	0	2.4	2.1	2.0	1.7	1.3	0.9	0.6
2006	77.0	0	2.9	2.5	2.0	1.7	1.5	1.0	0.6

Table 22: Historical percentiles of daily maximum one-hour nitrogen dioxide at Moe (2002-2008)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	96.7	0	0.036	0.030	0.029	0.027	0.026	0.021	0.014
2003	98.4	0	0.034	0.031	0.029	0.027	0.024	0.020	0.014
2004	100.0	0	0.032	0.026	0.024	0.023	0.021	0.018	0.014
2005	99.5	0	0.039	0.034	0.032	0.027	0.024	0.019	0.014
2006	81.1	0	0.058	0.030	0.029	0.026	0.024	0.020	0.016
2007	98.4	0	0.032	0.028	0.027	0.024	0.022	0.019	0.014
2008	99.7	0	0.046	0.028	0.026	0.023	0.021	0.017	0.013

Table 23: Percentiles of daily maximum one-hour nitrogen dioxide at Traralgon (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	98.1	0	0.033	0.031	0.030	0.027	0.025	0.020	0.015
2003	99.2	0	0.053	0.032	0.030	0.028	0.026	0.022	0.016
2004	98.6	0	0.036	0.034	0.030	0.028	0.024	0.019	0.015
2005	91.5	0	0.040	0.032	0.030	0.028	0.026	0.023	0.016
2006	99.2	0	0.045	0.027	0.026	0.025	0.023	0.020	0.015
2007	97.5	0	0.032	0.029	0.027	0.026	0.024	0.019	0.015
2008	99.5	0	0.039	0.033	0.029	0.026	0.024	0.020	0.014
2009	99.7	0	0.067	0.030	0.028	0.027	0.025	0.020	0.013
2010	99.2	0	0.031	0.026	0.026	0.025	0.023	0.019	0.014
2011	99.5	0	0.034	0.028	0.027	0.025	0.023	0.019	0.013
2012	97.8	0	0.032	0.028	0.026	0.025	0.022	0.019	0.013
2013	94.2	0	0.034	0.030	0.028	0.025	0.022	0.019	0.013
2014	95.3	0	0.031	0.028	0.027	0.025	0.022	0.018	0.013
2015	95.1	0	0.034	0.029	0.029	0.026	0.022	0.017	0.012
2016	86.6	0	0.036	0.033	0.030	0.027	0.024	0.020	0.014

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## F Ozone (O<sub>3</sub>)

### Assessment of compliance with standards and goals of the Measure for ozone

In Victoria, ozone is assessed against a one-hour standard of 0.10 ppm and a four-hour standard of 0.08 ppm, with one exceedance day allowed per year.

Table 24: 2016 compliance summary for ozone in Victoria

Region Performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days) annual mean (ppm)		Performance against the standard and goals	
	Q1	Q2	Q3	Q4	Annual	1-hour	4-hour	1-hour	4-hour
<b>Port Phillip</b>									
Alphington	95.7	93.6	94.7	92.3	94.1	0	0	MET	MET
Brighton <sup>a</sup>	5.5	0.0	0.0	0.0	1.4			ND	ND
Dandenong <sup>a</sup>	96.1	33.9	0.0	33.6	40.6			ND	ND
Footscray <sup>a</sup>	96.2	95.2	20.1	37.6	62.0			ND	ND
Geelong South	94.8	95.1	95.2	92.8	94.5	0	0	MET	MET
Melton <sup>a</sup>	95.6	42.3	0.0	52.4	47.3			ND	ND
Mooroolbark <sup>a</sup>	96.3	36.0	0.0	33.6	41.2			ND	ND
Point Cook <sup>a</sup>	96.4	63.4	0.0	52.4	52.8			ND	ND
<b>Latrobe Valley</b>									
Traralgon	95.6	95.1	89.6	71.6	88.0	0	0	MET	MET

- ND: not demonstrated
- a: Insufficient data to calculate percentile, <75 per cent data capture during year, values shown are excluded from trend analysis

### Analysis of air quality monitoring for ozone

The one-hour and four-hour standards for ozone was met at all stations during 2016 where there was sufficient data captured in the Port Phillip region and at Traralgon in the Latrobe Valley. The highest one-hour average in the Port Phillip region, at Point Cook, was 79 per cent of the standard and in the Latrobe Valley, at Traralgon, 68 per cent of the standard.

Table 25: 2016 summary statistics for daily peak one-hour ozone in Victoria

The Measure's standards: 0.10 ppm (one-hour average)  
The Measure's goal: standards exceeded on no more than one day per year

Region Performance monitoring station	Number of valid days	Highest reading (ppm)	Highest reading (date: hour)	2 <sup>nd</sup> highest reading (ppm)	2 <sup>nd</sup> highest reading (date:hour)
<b>Port Phillip</b>					
Alphington	354	0.061	Feb 06:18	0.060	Dec 30:14
Brighton	5	0.062	Feb 21:15	0.061	Jan 21:15
Dandenong	154	0.063	Feb 06:18 Feb 19:16		
Footscray	237	0.067	Mar 31:16	0.065	Dec 17:18
Geelong South	359	0.071	Feb 06:16	0.062	Dec 31:18 Dec 24:15
Melton	178	0.065	Feb 15:16	0.061	Feb 10:17
Mooroolbark	157	0.064	Mar 31:17	0.062	Jan 21:18
Point Cook	201	0.079	Jan 22:15	0.067	Feb 21:14
<b>Latrobe Valley</b>					
Traralgon	331	0.068	Dec 05:14	0.066	Dec 30:17

Table 26: 2016 summary statistics for daily peak four-hour ozone in Victoria

The Measure's standards: 0.08 ppm (four-hour average)  
The Measure's goal: standards exceeded on no more than one day per year

Region Performance monitoring station	Number of valid days	Highest reading (ppm)	Highest reading (date: hour)	2 <sup>nd</sup> highest reading (ppm)	2 <sup>nd</sup> highest reading (date:hour)
<b>Port Phillip</b>					
Alphington	353	0.059	Dec 30:16	0.056	Feb 15:18
Brighton	5	0.057	Jan 21:18	0.053	Feb 15:18 Feb 21:17
Dandenong	154	0.058	Feb 10:18	0.056	Feb 06:19

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<b>Footscray</b>	237	0.060	Dec 17:19	0.059	Feb 15:18
<b>Geelong South</b>	359	0.064	Feb 06:18	0.060	Dec 24:17
<b>Melton</b>	178	0.058	Feb 15:17	0.057	Feb 10:18
<b>Mooroolbark</b>	157	0.055	Dec 24:19	0.054	Dec 17:20
<b>Point Cook</b>	201	0.061	Dec 17:16 Feb 21:17		
<b>Latrobe Valley</b>					
<b>Traralgon</b>	331	0.065	Dec 30:18	0.061	Jan 06:17

Table 27: 2016 percentiles for daily peak one-hour ozone in Victoria

Region Performance monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm)					
			99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
<b>Alphington</b>	96.7	0.066	0.058	0.054	0.047	0.037	0.028	0.022
<b>Brighton</b>	1.4	0.044	0.043	0.043	0.041	0.038	0.030	0.028
<b>Dandenong</b>	42.1	0.060	0.058	0.057	0.053	0.046	0.036	0.026
<b>Footscray</b>	64.8	0.065	0.055	0.052	0.044	0.040	0.030	0.024
<b>Geelong South</b>	98.1	0.056	0.052	0.048	0.043	0.035	0.028	0.025
<b>Melton</b>	48.6	0.070	0.062	0.058	0.052	0.046	0.038	0.028
<b>Mooroolbark</b>	42.9	0.073	0.068	0.065	0.054	0.049	0.040	0.029
<b>Point Cook</b>	54.9	0.066	0.061	0.059	0.049	0.043	0.033	0.026
<b>Latrobe Valley</b>								
<b>Traralgon</b>	90.4	0.063	0.051	0.043	0.038	0.033	0.028	0.025

Table 28: 2016 percentiles for daily peak four-hour ozone in Victoria

Region Performance monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm)					
			99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
<b>Alphington</b>	96.4	0.058	0.052	0.050	0.044	0.035	0.027	0.022
<b>Brighton</b>	1.4	0.058	0.057	0.056	0.052	0.046	0.027	0.023
<b>Dandenong</b>	42.1	0.057	0.055	0.054	0.049	0.043	0.033	0.025
<b>Footscray</b>	64.8	0.053	0.051	0.049	0.043	0.038	0.029	0.023
<b>Geelong South</b>	98.1	0.051	0.047	0.044	0.039	0.033	0.027	0.024
<b>Melton</b>	48.6	0.058	0.057	0.053	0.049	0.044	0.036	0.027
<b>Mooroolbark</b>	42.9	0.066	0.062	0.061	0.052	0.045	0.038	0.027
<b>Point Cook</b>	54.9	0.057	0.057	0.055	0.046	0.040	0.032	0.026
<b>Latrobe Valley</b>								
<b>Traralgon</b>	90.4	0.059	0.047	0.041	0.035	0.031	0.027	0.024

## Trends and pollutant distributions for ozone between 2002 and 2016

Results and further analysis of the monitoring data are presented in this section. Percentiles of 2016 daily peak concentrations are provided for each station and standard. In these tables, daily peak values are formed only when at least 75 per cent of the data for the day are valid. Data for stations with less than 15 per cent data in the year are omitted and stations with less than 75 per cent data are shown in italics. Exceedances are shown in bold. The percentiles for eight-hour carbon monoxide and four-hour ozone are based on running averages, including those that overlap from one day to the next.

Percentiles of the daily peak concentrations in Port Phillip Region are plotted from 2002, when monitoring according to the Measure's protocol ensured greater continuity of stations operating each year. The values plotted are averages of the percentiles from stations having at least 75 per cent of data in the year. Different stations and different statistics can suggest different trend behaviour; no estimates of statistical significance are presented.

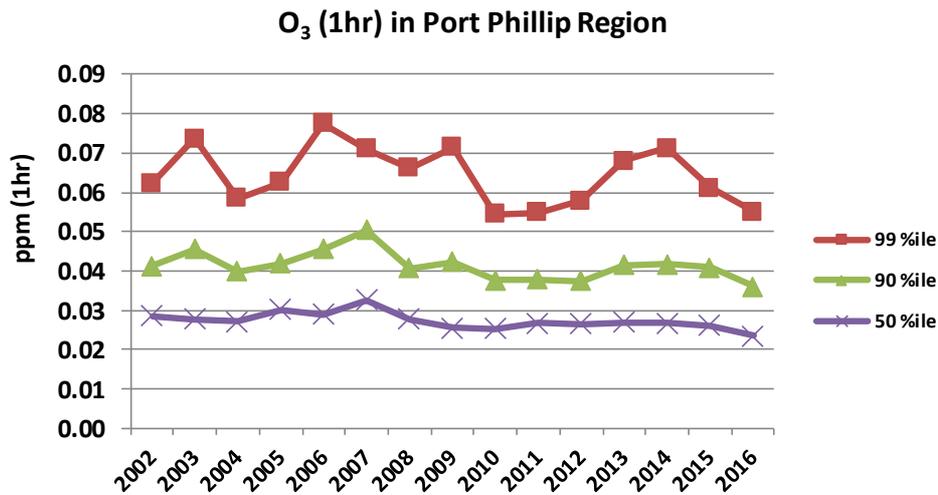


Figure 5: Percentiles of daily maximum one-hour ozone (average of Port Phillip stations 2002–2016)

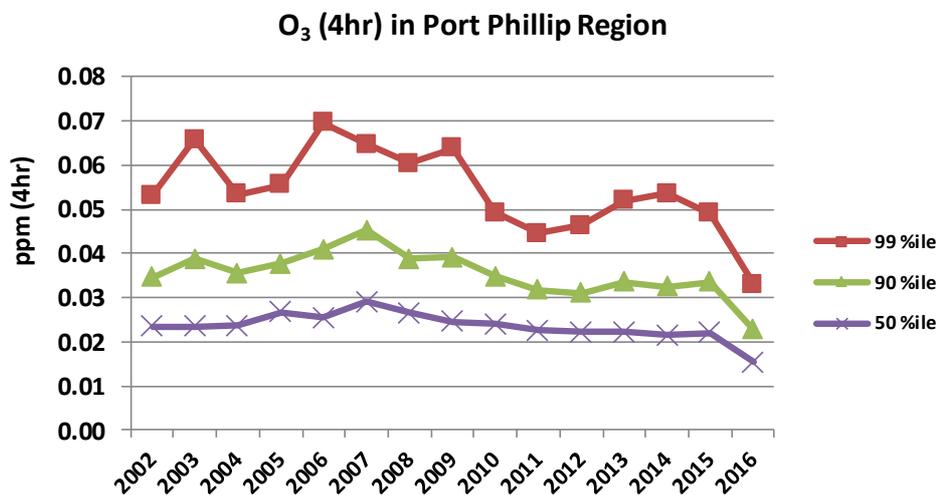


Figure 6: Percentiles of daily maximum four-hour ozone (average of Port Phillip stations 2002–2016)

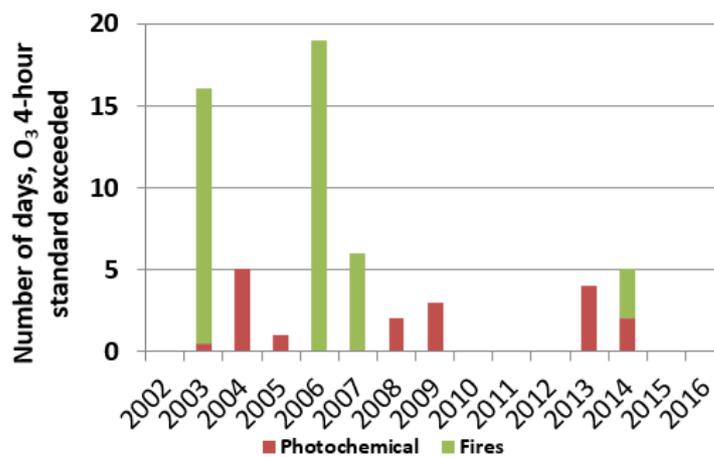


Figure 7: Inferred causes of exceedances of the ozone four-hour standard (Port Phillip region 2002-2016)

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Exceedances of both the four-hour and (less frequently) one-hour standards have been recorded. Major bushfires in 2003, 2006, 2007 and 2014 caused or exacerbated many of the ozone exceedances observed.

## One-hour ozone trends

Table 29: Percentiles of daily maximum one-hour ozone at Alphington (2002–2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	89.6	0	0.051	0.048	0.046	0.040	0.036	0.027	0.023
2003	96.4	1	0.102	0.064	0.059	0.050	0.041	0.030	0.025
2004	96.7	0	0.073	0.048	0.046	0.040	0.037	0.028	0.023
2005	92.9	0	0.077	0.058	0.051	0.045	0.039	0.031	0.026
2006	90.1	3	0.127	0.084	0.068	0.059	0.048	0.033	0.026
2007	98.9	1	0.121	0.072	0.067	0.060	0.048	0.034	0.029
2008	97.3	0	0.075	0.056	0.051	0.044	0.037	0.028	0.023
2009	96.7	0	0.084	0.070	0.055	0.045	0.040	0.028	0.023
2010	88.2	0	0.061	0.048	0.044	0.040	0.035	0.027	0.022
2011	96.7	0	0.073	0.053	0.052	0.045	0.038	0.031	0.026
2012 <sup>a</sup>	33.1	0	0.057	0.055	0.051	0.042	0.033	0.026	0.023
2013	85.2	0	0.097	0.062	0.059	0.044	0.038	0.030	0.025
2014	97.0	1	0.131	0.076	0.065	0.052	0.043	0.031	0.026
2015	91.0	0	0.061	0.055	0.053	0.048	0.042	0.032	0.025
2016	96.7	0	0.066	0.058	0.054	0.047	0.037	0.028	0.022

a: data availability between 15 and 75 per cent, values displayed in italics

Table 30: Percentiles of daily maximum one-hour ozone at Brighton (2002–2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	93.7	0	0.085	0.063	0.053	0.043	0.036	0.029	0.025
2003	99.2	2	0.109	0.070	0.065	0.056	0.046	0.029	0.025
2004	94.5	1	0.106	0.062	0.058	0.043	0.039	0.030	0.025
2005	97.8	0	0.088	0.067	0.053	0.047	0.040	0.032	0.028
2006	92.9	1	0.114	0.080	0.072	0.059	0.046	0.032	0.026
2007	99.7	1	0.122	0.076	0.069	0.060	0.053	0.039	0.032
2008	98.9	0	0.090	0.073	0.071	0.050	0.044	0.034	0.029
2009	95.3	0	0.077	0.072	0.064	0.052	0.042	0.030	0.025
2010	80.5	0	0.060	0.053	0.051	0.043	0.038	0.030	0.026
2011	98.6	0	0.074	0.057	0.053	0.044	0.038	0.031	0.027
2012	99.2	0	0.069	0.055	0.050	0.044	0.038	0.030	0.026
2013	99.2	0	0.078	0.066	0.060	0.052	0.042	0.031	0.026
2014 <sup>a</sup>	68.5	1	0.091	0.087	0.078	0.056	0.047	0.033	0.026
2015	99.5	0	0.067	0.061	0.058	0.046	0.041	0.030	0.025
2016 <sup>b</sup>	1.4								

a: data availability between 15 and 75 per cent, values displayed in italics

b: data availability less than 15 per cent, no values displayed

Table 31: Percentiles of daily maximum one-hour ozone at Dandenong (2002–2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	84.9	0	0.078	0.064	0.054	0.047	0.040	0.032	0.027
2003	97.5	0	0.098	0.079	0.061	0.053	0.044	0.028	0.024
2004	96.4	0	0.080	0.064	0.049	0.042	0.038	0.029	0.024
2005	92.6	0	0.072	0.062	0.054	0.045	0.041	0.033	0.028
2006	98.9	1	0.108	0.067	0.065	0.057	0.046	0.033	0.027
2007	98.6	1	0.112	0.072	0.063	0.056	0.047	0.035	0.028
2008	100.0	0	0.074	0.063	0.056	0.048	0.041	0.031	0.027
2009	98.4	0	0.068	0.065	0.063	0.051	0.042	0.030	0.025
2010	97.8	0	0.077	0.059	0.053	0.044	0.038	0.029	0.024
2011	99.7	0	0.063	0.059	0.054	0.047	0.038	0.032	0.027
2012	98.6	0	0.068	0.060	0.051	0.042	0.038	0.029	0.026
2013 <sup>a</sup>	72.6	0	0.094	0.066	0.064	0.056	0.044	0.031	0.025
2014 <sup>a</sup>	72.1	0	0.083	0.078	0.075	0.057	0.048	0.033	0.025
2015	98.6	0	0.071	0.060	0.057	0.050	0.041	0.031	0.026

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Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2016 <sup>a</sup>	42.1	0	0.060	0.058	0.057	0.053	0.046	0.036	0.026

a: data availability between 15 and 75 per cent, values displayed in italics

Table 32: Percentiles of daily maximum one-hour ozone at Footscray (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	96.7	0	0.095	0.066	0.047	0.042	0.038	0.028	0.024
2003	98.1	1	0.105	0.072	0.061	0.051	0.041	0.027	0.023
2004	94.8	1	0.106	0.058	0.049	0.042	0.036	0.028	0.024
2005	99.2	0	0.082	0.063	0.052	0.044	0.039	0.031	0.027
2006	91.5	1	0.127	0.082	0.066	0.053	0.041	0.030	0.024
2007	99.2	1	0.127	0.067	0.063	0.057	0.049	0.035	0.029
2008	98.4	0	0.073	0.065	0.055	0.048	0.041	0.032	0.026
2009	94.2	0	0.085	0.071	0.060	0.051	0.043	0.030	0.025
2010	99.7	0	0.068	0.053	0.049	0.042	0.038	0.030	0.025
2011	97.8	0	0.078	0.050	0.049	0.044	0.037	0.030	0.026
2012	81.1	0	0.057	0.053	0.044	0.042	0.036	0.030	0.026
2013 <sup>a</sup>	74.8	0	0.083	0.060	0.055	0.042	0.037	0.029	0.025
2014	99.5	0	0.100	0.077	0.063	0.050	0.042	0.031	0.026
2015	99.5	0	0.064	0.058	0.054	0.046	0.040	0.031	0.025
2016 <sup>a</sup>	64.8	0	0.065	0.055	0.052	0.044	0.040	0.030	0.024

a: data availability between 15 and 75 per cent, values displayed in italics

Table 33: Percentiles of daily maximum one-hour ozone at Geelong South (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	90.7	0	0.058	0.056	0.053	0.043	0.032	0.025	0.021
2003	97.3	0	0.081	0.069	0.063	0.043	0.033	0.023	0.020
2004	92.1	0	0.094	0.061	0.058	0.044	0.035	0.030	0.025
2005	97.8	0	0.080	0.059	0.056	0.046	0.039	0.031	0.028
2006	95.1	2	0.169	0.076	0.062	0.049	0.040	0.031	0.026
2007	99.7	0	0.088	0.068	0.063	0.053	0.045	0.035	0.030
2008	98.6	0	0.084	0.073	0.063	0.047	0.038	0.032	0.029
2009	99.5	0	0.083	0.066	0.059	0.050	0.038	0.030	0.026
2010	96.2	0	0.084	0.057	0.052	0.047	0.039	0.031	0.027
2011	99.7	0	0.055	0.050	0.046	0.040	0.036	0.030	0.026
2012	98.9	0	0.079	0.059	0.053	0.039	0.034	0.029	0.026
2013	99.2	0	0.079	0.066	0.058	0.046	0.036	0.029	0.026
2014	98.1	0	0.077	0.058	0.053	0.045	0.038	0.030	0.026
2015	99.7	0	0.079	0.062	0.054	0.044	0.038	0.030	0.026
2016	98.1	0	0.056	0.052	0.048	0.043	0.035	0.028	0.025

Table 34: Percentiles of daily maximum one-hour ozone at Melton (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002 <sup>a</sup>	14.2								
2003	97.8	1	0.112	0.083	0.074	0.056	0.046	0.032	0.029
2004	94.0	0	0.076	0.053	0.050	0.047	0.040	0.033	0.028
2005	94.0	0	0.079	0.063	0.056	0.048	0.043	0.036	0.031
2006	99.2	1	0.126	0.084	0.067	0.053	0.046	0.036	0.030
2007	89.6	0	0.085	0.076	0.071	0.064	0.054	0.037	0.032
2008	90.2	0	0.067	0.056	0.052	0.047	0.041	0.033	0.030
2009	97.5	0	0.092	0.074	0.065	0.054	0.044	0.032	0.027
2010	90.4	0	0.062	0.059	0.051	0.044	0.039	0.031	0.027
2011	96.4	0	0.071	0.054	0.050	0.043	0.038	0.031	0.028
2012	95.9	0	0.068	0.060	0.050	0.044	0.037	0.031	0.027
2013	98.6	0	0.086	0.071	0.066	0.054	0.045	0.033	0.029
2014	96.2	0	0.088	0.070	0.066	0.051	0.042	0.034	0.028

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Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2015	99.5	0	0.072	0.066	0.057	0.048	0.042	0.033	0.028
2016 <sup>b</sup>	48.6	0	0.070	0.062	0.058	0.052	0.046	0.038	0.028

a: Less than 15 per cent data capture, percentiles not displayed

b: data availability between 15 and 75 per cent, values displayed in italics

Table 35: Percentiles of daily maximum one-hour ozone at Mooroolbark (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002 <sup>a</sup>	57.5	0	0.089	0.070	0.055	0.046	0.038	0.033	0.028
2003	99.7	0	0.098	0.072	0.065	0.055	0.047	0.031	0.026
2004	95.6	0	0.072	0.056	0.053	0.047	0.042	0.034	0.027
2005	97.8	0	0.089	0.064	0.053	0.045	0.042	0.035	0.029
2006	96.2	1	0.101	0.086	0.071	0.058	0.048	0.036	0.028
2007	99.7	0	0.084	0.076	0.072	0.057	0.051	0.038	0.031
2008	98.6	0	0.081	0.064	0.057	0.051	0.045	0.034	0.027
2009	96.7	0	0.087	0.077	0.068	0.055	0.048	0.036	0.027
2010	96.2	0	0.066	0.055	0.051	0.042	0.037	0.030	0.025
2011	100.0	0	0.078	0.060	0.051	0.043	0.037	0.031	0.026
2012	99.5	0	0.077	0.057	0.055	0.048	0.039	0.031	0.027
2013	98.6	0	0.088	0.068	0.064	0.054	0.046	0.033	0.027
2014	69.6	0	0.099	0.081	0.076	0.055	0.050	0.035	0.026
2015 <sup>a</sup>	58.1	0	0.065	0.055	0.051	0.046	0.039	0.028	0.024
2016 <sup>a</sup>	42.9	0	0.073	0.068	0.065	0.054	0.049	0.040	0.029

a: data availability between 15 and 75 per cent, values displayed in italics

Table 36: Percentiles of daily maximum one-hour ozone at Point Cook (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	97.0	0	0.093	0.068	0.063	0.048	0.039	0.030	0.027
2003	97.0	0	0.094	0.080	0.069	0.053	0.041	0.031	0.025
2004	98.6	0	0.093	0.065	0.056	0.047	0.039	0.028	0.025
2005	97.0	0	0.092	0.068	0.059	0.047	0.038	0.031	0.027
2006	85.2	1	0.104	0.069	0.062	0.048	0.039	0.029	0.026
2007	99.5	0	0.095	0.070	0.064	0.057	0.047	0.038	0.034
2008	99.7	0	0.088	0.081	0.065	0.049	0.043	0.035	0.031
2009	96.2	2	0.102	0.085	0.071	0.057	0.045	0.032	0.026
2010	95.9	0	0.058	0.053	0.047	0.042	0.037	0.030	0.025
2011	91.5	0	0.069	0.054	0.052	0.047	0.041	0.032	0.028
2012	97.5	0	0.092	0.061	0.058	0.046	0.039	0.032	0.028
2013	97.0	0	0.089	0.075	0.068	0.052	0.042	0.032	0.028
2014	98.9	0	0.093	0.075	0.067	0.054	0.043	0.032	0.028
2015	98.4	0	0.076	0.066	0.064	0.047	0.042	0.032	0.028
2016 <sup>a</sup>	54.9	0	0.066	0.061	0.059	0.049	0.043	0.033	0.026

a: data availability between 15 and 75 per cent, values displayed in italics

Table 37: Percentiles of daily maximum one-hour ozone at Traralgon (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	100.0	0	0.057	0.048	0.043	0.036	0.033	0.029	0.024
2003	97.3	0	0.077	0.062	0.060	0.049	0.037	0.030	0.024
2004	97.5	0	0.058	0.049	0.048	0.042	0.037	0.031	0.025
2005	86.3	0	0.067	0.050	0.046	0.040	0.035	0.031	0.026
2006	100.0	3	0.138	0.083	0.077	0.052	0.044	0.033	0.027
2007	99.2	0	0.094	0.067	0.061	0.052	0.041	0.031	0.027
2008	100.0	0	0.061	0.055	0.048	0.038	0.032	0.026	0.023
2009	95.3	1	0.104	0.053	0.050	0.040	0.034	0.027	0.024
2010	100.0	0	0.057	0.050	0.047	0.039	0.033	0.027	0.024
2011	100.0	0	0.050	0.040	0.039	0.035	0.031	0.027	0.022

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Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	99.7	0	0.054	0.047	0.043	0.036	0.033	0.028	0.024
2013	97.3	0	0.092	0.059	0.054	0.044	0.039	0.029	0.024
2014	97.0	0	0.077	0.066	0.056	0.045	0.037	0.028	0.024
2015	97.5	0	0.059	0.053	0.049	0.041	0.035	0.028	0.023
2016	90.4	0	0.063	0.051	0.043	0.038	0.033	0.028	0.025

## Four-hour ozone trends

Table 38: Percentiles of daily maximum four-hour ozone at Alphington (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	89.3	0	0.046	0.044	0.043	0.038	0.033	0.026	0.021
2003	95.9	1	0.090	0.058	0.053	0.047	0.038	0.028	0.023
2004	96.4	0	0.069	0.045	0.044	0.038	0.034	0.026	0.022
2005	92.9	0	0.070	0.050	0.047	0.042	0.037	0.030	0.025
2006	90.1	3	0.116	0.073	0.063	0.054	0.045	0.031	0.025
2007	98.6	1	0.115	0.065	0.062	0.053	0.046	0.033	0.027
2008	97.3	0	0.063	0.050	0.047	0.038	0.035	0.027	0.022
2009	96.4	0	0.080	0.064	0.048	0.041	0.036	0.027	0.022
2010	87.9	0	0.057	0.044	0.041	0.037	0.033	0.026	0.021
2011	97.0	0	0.069	0.048	0.045	0.042	0.036	0.029	0.025
2012 <sup>a</sup>	33.1	0	0.054	0.048	0.048	0.038	0.032	0.025	0.022
2013	84.9	1	0.082	0.057	0.054	0.041	0.036	0.029	0.024
2014	96.7	1	0.114	0.066	0.055	0.048	0.039	0.030	0.025
2015	91.0	0	0.059	0.052	0.048	0.044	0.040	0.029	0.024
2016	96.4	0	0.058	0.052	0.050	0.044	0.035	0.027	0.022

a: data availability between 15 and 75 per cent, values displayed in italics

Table 39: Percentiles of daily maximum four-hour ozone at Brighton (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	93.2	0	0.072	0.056	0.048	0.039	0.034	0.028	0.023
2003	98.4	2	0.102	0.065	0.061	0.048	0.042	0.028	0.024
2004	94.5	1	0.092	0.057	0.051	0.042	0.036	0.029	0.024
2005	97.5	0	0.069	0.062	0.051	0.043	0.038	0.030	0.026
2006	92.9	3	0.105	0.075	0.065	0.054	0.043	0.031	0.025
2007	99.7	1	0.111	0.068	0.063	0.054	0.049	0.036	0.031
2008	98.6	0	0.079	0.068	0.066	0.047	0.041	0.033	0.028
2009	95.3	0	0.069	0.066	0.058	0.049	0.038	0.029	0.024
2010	80.0	0	0.055	0.048	0.046	0.039	0.035	0.029	0.024
2011	97.8	0	0.063	0.053	0.047	0.041	0.036	0.030	0.026
2012	99.2	0	0.065	0.052	0.048	0.041	0.037	0.029	0.025
2013	99.2	0	0.067	0.057	0.055	0.049	0.040	0.030	0.025
2014	68.5	1	0.084	0.078	0.071	0.053	0.044	0.031	0.024
2015	99.5	0	0.060	0.056	0.053	0.044	0.038	0.029	0.024
2016 <sup>a</sup>	1.4								

a: data availability less the 15 per cent, no values displayed

Table 40: Percentiles of daily maximum four-hour ozone at Dandenong (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	85.2	0	0.063	0.053	0.052	0.043	0.038	0.030	0.025
2003	97.8	2	0.093	0.067	0.059	0.047	0.040	0.027	0.023
2004	96.7	0	0.067	0.058	0.046	0.040	0.035	0.027	0.023
2005	92.6	0	0.067	0.054	0.052	0.043	0.039	0.031	0.026
2006	98.6	1	0.096	0.061	0.058	0.052	0.042	0.031	0.026
2007	98.6	1	0.106	0.064	0.060	0.052	0.044	0.033	0.027
2008	100.0	0	0.073	0.058	0.053	0.044	0.040	0.030	0.025

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Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2009	98.4	0	0.063	0.059	0.054	0.047	0.039	0.028	0.024
2010	97.5	0	0.071	0.054	0.048	0.043	0.037	0.030	0.025
2011	99.5	0	0.058	0.054	0.051	0.044	0.037	0.031	0.026
2012	98.6	0	0.066	0.052	0.048	0.040	0.036	0.028	0.024
2013 <sup>a</sup>	72.6	1	0.083	0.062	0.058	0.053	0.040	0.029	0.024
2014 <sup>a</sup>	72.1	0	0.078	0.071	0.068	0.053	0.046	0.031	0.024
2015	98.6	0	0.064	0.058	0.054	0.046	0.039	0.029	0.025
2016 <sup>a</sup>	42.1	0	0.057	0.055	0.054	0.049	0.043	0.033	0.025

a: data availability between 15 and 75 per cent, values displayed in italics

Table 41: Percentiles of daily maximum four-hour ozone at Footscray (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup> (ppm)	70 <sup>th</sup>	50 <sup>th</sup>
2002	96.7	0	0.080	0.051	0.046	0.038	0.034	0.027	0.023
2003	97.8	2	0.094	0.063	0.056	0.045	0.038	0.026	0.021
2004	94.8	1	0.083	0.051	0.045	0.039	0.034	0.027	0.022
2005	98.9	0	0.066	0.053	0.047	0.042	0.035	0.030	0.025
2006	91.2	3	0.103	0.070	0.059	0.047	0.040	0.028	0.023
2007	98.9	1	0.113	0.060	0.057	0.052	0.045	0.033	0.028
2008	98.1	0	0.064	0.059	0.053	0.042	0.039	0.030	0.025
2009	94.2	0	0.073	0.063	0.055	0.046	0.038	0.028	0.024
2010	99.7	0	0.061	0.050	0.045	0.040	0.034	0.029	0.024
2011	97.3	0	0.067	0.045	0.044	0.041	0.034	0.029	0.024
2012	81.1	0	0.052	0.048	0.043	0.038	0.034	0.029	0.025
2013 <sup>a</sup>	74.8	0	0.065	0.054	0.051	0.041	0.033	0.028	0.024
2014	99.5	1	0.082	0.069	0.056	0.046	0.039	0.030	0.025
2015	99.5	0	0.055	0.051	0.049	0.043	0.037	0.029	0.024
2016 <sup>a</sup>	64.8	0	0.053	0.051	0.049	0.043	0.038	0.029	0.023

a: data availability between 15 and 75 per cent, values displayed in italics

Table 42: Percentiles of daily maximum four-hour ozone at Geelong South (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	89.3	0	0.053	0.048	0.046	0.038	0.031	0.024	0.020
2003	97.0	0	0.072	0.059	0.054	0.040	0.029	0.022	0.019
2004	91.3	1	0.085	0.054	0.052	0.041	0.034	0.028	0.023
2005	97.3	0	0.068	0.055	0.049	0.042	0.037	0.030	0.026
2006	94.2	2	0.142	0.070	0.059	0.047	0.038	0.030	0.025
2007	99.7	0	0.076	0.062	0.057	0.049	0.042	0.034	0.029
2008	98.1	0	0.076	0.067	0.060	0.045	0.038	0.031	0.028
2009	99.5	0	0.079	0.058	0.054	0.046	0.036	0.029	0.025
2010	95.9	0	0.067	0.048	0.044	0.039	0.035	0.029	0.024
2011	99.2	0	0.052	0.045	0.043	0.037	0.034	0.029	0.025
2012	98.9	0	0.070	0.053	0.049	0.037	0.032	0.028	0.025
2013	99.2	0	0.065	0.060	0.054	0.044	0.035	0.029	0.025
2014	98.4	0	0.075	0.053	0.049	0.042	0.036	0.029	0.025
2015	99.7	0	0.061	0.056	0.050	0.042	0.035	0.029	0.025
2016	98.1	0	0.051	0.047	0.044	0.039	0.033	0.027	0.024

Table 43: Percentiles of daily maximum four-hour ozone at Melton (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002 <sup>a</sup>	14.5								
2003	97.8	4	0.099	0.077	0.063	0.052	0.042	0.032	0.028
2004	94.0	0	0.068	0.050	0.047	0.043	0.038	0.031	0.027
2005	94.2	0	0.075	0.054	0.051	0.045	0.041	0.034	0.030
2006	99.2	3	0.115	0.073	0.060	0.051	0.043	0.034	0.029
2007	89.9	0	0.080	0.068	0.066	0.057	0.050	0.036	0.031

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Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2008	90.2	0	0.057	0.052	0.048	0.045	0.039	0.032	0.029
2009	97.5	0	0.078	0.063	0.057	0.049	0.042	0.031	0.026
2010	90.1	0	0.058	0.048	0.042	0.040	0.035	0.029	0.026
2011	96.4	0	0.065	0.051	0.047	0.041	0.036	0.030	0.027
2012	95.9	0	0.061	0.052	0.046	0.040	0.035	0.030	0.027
2013	98.6	1	0.081	0.062	0.060	0.049	0.042	0.032	0.028
2014	96.2	0	0.078	0.063	0.057	0.049	0.041	0.033	0.027
2015	99.5	0	0.070	0.059	0.050	0.045	0.040	0.032	0.027
2016 <sup>a</sup>	48.6	0	0.058	0.057	0.053	0.049	0.044	0.036	0.027

a: data availability is less than 15 per cent, percentile values not shown

Table 44: Percentiles of daily maximum four-hour ozone at Mooroolbark (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002 <sup>a</sup>	57.5	0	0.075	0.063	0.047	0.041	0.036	0.030	0.026
2003	98.9	3	0.090	0.065	0.056	0.050	0.044	0.030	0.025
2004	95.6	0	0.059	0.050	0.049	0.044	0.038	0.032	0.025
2005	97.8	0	0.072	0.055	0.049	0.043	0.039	0.033	0.028
2006	96.2	2	0.091	0.077	0.064	0.054	0.045	0.034	0.026
2007	99.5	0	0.077	0.072	0.066	0.054	0.047	0.036	0.030
2008	98.6	0	0.073	0.057	0.053	0.047	0.041	0.032	0.027
2009	96.7	0	0.076	0.066	0.062	0.050	0.045	0.033	0.026
2010	95.9	0	0.062	0.055	0.052	0.044	0.036	0.027	0.023
2011	99.7	0	0.069	0.053	0.046	0.039	0.035	0.029	0.024
2012	99.5	0	0.069	0.055	0.050	0.043	0.036	0.030	0.026
2013	98.4	1	0.083	0.062	0.058	0.049	0.043	0.032	0.026
2014	69.6	1	0.081	0.074	0.068	0.050	0.045	0.034	0.025
2015	58.1	0	0.061	0.049	0.047	0.042	0.035	0.027	0.023
2016 <sup>a</sup>	42.9	0	0.066	0.062	0.061	0.052	0.045	0.038	0.027

a: data availability between 15 and 75 per cent, values displayed in italics

Table 45: Percentiles of daily maximum four-hour ozone at Point Cook (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	96.4	0	0.070	0.062	0.056	0.044	0.036	0.029	0.025
2003	96.2	1	0.093	0.072	0.063	0.048	0.038	0.029	0.024
2004	98.6	1	0.082	0.058	0.051	0.044	0.036	0.027	0.024
2005	96.7	1	0.082	0.062	0.050	0.043	0.037	0.030	0.026
2006	84.9	1	0.089	0.061	0.057	0.046	0.036	0.027	0.025
2007	99.5	1	0.086	0.067	0.060	0.052	0.044	0.037	0.033
2008	99.7	2	0.082	0.074	0.061	0.045	0.040	0.034	0.030
2009	95.9	2	0.095	0.074	0.069	0.053	0.042	0.030	0.025
2010	96.2	0	0.054	0.044	0.044	0.037	0.034	0.029	0.026
2011	91.2	0	0.058	0.051	0.048	0.044	0.039	0.031	0.027
2012	97.5	0	0.073	0.058	0.051	0.043	0.037	0.031	0.027
2013	97.0	0	0.079	0.065	0.059	0.050	0.039	0.031	0.027
2014	99.2	0	0.080	0.070	0.061	0.050	0.040	0.031	0.027
2015	98.4	0	0.062	0.060	0.057	0.046	0.040	0.031	0.027
2016 <sup>a</sup>	54.9	0	0.057	0.057	0.055	0.046	0.040	0.032	0.026

a: data availability between 15 and 75 per cent, values displayed in italics

Table 46: Percentiles of daily maximum four-hour ozone at Traralgon (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	100.0	0	0.049	0.046	0.038	0.034	0.031	0.027	0.022
2003	97.3	0	0.067	0.056	0.052	0.046	0.035	0.027	0.023
2004	97.3	0	0.050	0.044	0.043	0.039	0.034	0.029	0.023
2005	86.1	0	0.055	0.046	0.039	0.035	0.033	0.029	0.024

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Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2006	100.0	2	0.123	0.072	0.067	0.046	0.041	0.031	0.026
2007	99.2	1	0.082	0.058	0.056	0.047	0.037	0.029	0.026
2008	100.0	0	0.053	0.050	0.042	0.036	0.030	0.025	0.022
2009	95.6	0	0.074	0.047	0.045	0.037	0.031	0.026	0.022
2010	100.0	0	0.047	0.043	0.040	0.036	0.031	0.026	0.022
2011	100.0	0	0.044	0.037	0.036	0.033	0.030	0.026	0.021
2012	99.7	0	0.053	0.041	0.039	0.033	0.030	0.026	0.022
2013	97.3	1	0.086	0.054	0.05	0.04	0.035	0.027	0.022
2014	97.5	0	0.062	0.059	0.053	0.042	0.035	0.026	0.023
2015	97.5	0	0.053	0.047	0.045	0.036	0.033	0.026	0.022
2016	90.4	0	0.059	0.047	0.041	0.035	0.031	0.027	0.024

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## G Sulfur dioxide (SO<sub>2</sub>)

### Assessment of compliance with standards and goals of the Measure for sulfur dioxide

In Victoria, sulfur dioxide is assessed against a one-hour standard of 0.200 ppm and a daily standard of 0.080 ppm, with one exceedance day allowed per year.

Table 47: 2016 compliance summary for sulfur dioxide in Victoria

Region Performance monitoring station	Date availability rates (% of hours)					Exceedances (days)		Annual mean (ppm)	Performance against the standards and goal		
	Q1	Q2	Q3	Q4	Annual	1-hour	24-hour		1-hour	24-hour	1-year
<b>Port Phillip</b>											
Alphington	95.8	93.5	84.6	92.5	91.6	0	0	0.0004	MET	MET	MET
Altona North <sup>a</sup>	58.4	56.1	88.9	91.9	74.0	0	0	0.0010	ND	ND	ND
Geelong South	94.4	94.7	94.8	92.5	94.1	0	0	0.0010	MET	MET	MET
<b>Latrobe Valley</b>											
Traralgon	90.2	93.5	92.1	72.1	87.0	0	0	0.0010	MET	MET	MET

a: Insufficient data to calculate percentile, <75 per cent data capture during year, values shown are excluded from trend analysis  
ND: not demonstrated

Table 48: 2016 summary statistics for daily peak one-hour sulfur dioxide in Victoria

The Measure's standard: 0.20 ppm (one-hour average)

The Measure's goal: standard exceeded on no more than one day per year

Region Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2 <sup>nd</sup> highest (ppm)	2 <sup>nd</sup> highest (date:hour)
<b>Port Phillip</b>					
Alphington	337	0.011	Mar 07:02	0.010	Apr 23:12 Feb 13:10 Mar 23:07 Jan 24:04
Altona North	276	0.041	Feb 09:13	0.038	Apr 18:20 Jan 03:22
Geelong South	356	0.008	Sep 06:07	0.007	Feb 13:16 Apr 15:12
<b>Latrobe Valley</b>					
Traralgon	324	0.057	Nov 16:15	0.034	Dec 11:14

Table 49: 2016 summary statistics for daily sulfur dioxide in Victoria

The Measure's standard: 0.08 ppm (24-hour average)

The Measure's goal: standard exceeded on no more than one day per year

Region Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date)	2 <sup>nd</sup> highest (ppm)	2 <sup>nd</sup> highest (date)
<b>Port Phillip</b>					
Alphington	337	0.02	Jun 04 Jun 02 Apr 12 Jan 02 Jun 03 Jan 06 Jul 20 Jan 16 Jun 01		
Altona North	276	0.013	Nov 05	0.011	Dec 17
Geelong South	356	0.002	Jun 19 May 22 Oct 28 Apr 04 Jun 03 Apr 18 Aug 06 Apr 19 Dec 04 Apr 26		

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Region Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date)	2 <sup>nd</sup> highest (ppm)	2 <sup>nd</sup> highest (date)
			Jun 01		
<b>Latrobe Valley</b>					
<b>Traralgon</b>	324	0.006	Jul 15 Dec 22		

Sulfur dioxide levels were well below the standards at all stations. Maximum one-hour averages are higher relative to the standard than the 24-hour or annual averages. The highest one-hour average in the Port Phillip region, at Altona North, was 22 per cent of the standard and in the Latrobe Valley, at Traralgon, 28.5 per cent of the standard. The highest 24-hour average in the Port Phillip region, at Altona North, was 16.3 per cent of the standard and in the Latrobe Valley, at Traralgon, 7.5 per cent of the standard. Annual averages at all stations (see Table 47) are close to the limit of detection.

Table 50: 2016 percentiles of daily peak one-hour sulfur dioxide concentrations in Victoria

The Measure's standard: 0.20 ppm (one-hour average)

The Measure's goal: standard exceeded on no more than one day per year

Region	Data availability	Max	Percentiles (ppm)					
Performance monitoring station	(% of days)	(ppm)	99th	98 <sup>th</sup>	95th	90th	75th	50 <sup>th</sup>
<b>Port Phillip</b>								
<b>Alphington</b>	92.1	0.009	0.008	0.007	0.005	0.004	0.002	0.001
<b>Altona North</b>	75.4	0.044	0.039	0.033	0.024	0.020	0.008	0.003
<b>Geelong South</b>	97.3	0.010	0.007	0.006	0.005	0.004	0.002	0.001
<b>Latrobe Valley</b>								
<b>Traralgon</b>	88.5	0.057	0.023	0.017	0.014	0.010	0.006	0.003

Table 51: 2016 percentiles of daily sulfur dioxide concentrations in Victoria

The Measure's standard: 0.08 ppm (24-hour average)

The Measure's goal: standard exceeded on no more than one day per year

Region	Data availability	Max	Percentiles (ppm)					
Performance monitoring station	(% of days)	(ppm)	99th	98 <sup>th</sup>	95th	90th	75th	50 <sup>th</sup>
<b>Port Phillip</b>								
<b>Alphington</b>	92.1	0.002	0.002	0.002	0.001	0.001	0.001	0.000
<b>Altona North</b>	75.4	0.013	0.008	0.006	0.004	0.003	0.002	0.001
<b>Geelong South</b>	97.3	0.002	0.002	0.002	0.001	0.001	0.000	0.000
<b>Latrobe Valley</b>								
<b>Traralgon</b>	88.5	0.006	0.005	0.004	0.003	0.002	0.001	0.001

## Trends and pollutant distributions for sulfur dioxide between 2002 and 2016

Results and further analysis of the monitoring data are presented in this section. Percentiles of 2016 daily peak concentrations are provided for each station and standard. In these tables, daily peak values are formed only when at least 75 per cent of the data for the day are valid. Data for stations with less than 15 per cent data in the year are omitted and stations with less than 75 per cent data are shown in italics. Exceedances are shown in bold. The percentiles for eight-hour carbon monoxide and four-hour ozone are based on running averages, including those that overlap from one day to the next.

Percentiles of the daily peak concentrations in Port Phillip Region are plotted from 2002, when monitoring according to the Measure's protocol ensured greater continuity of stations operating each year. The values plotted are averages of the percentiles from stations having at least 75 per cent of data in the year. Different stations and different statistics can suggest different trend behaviour; no estimates of statistical significance are presented.

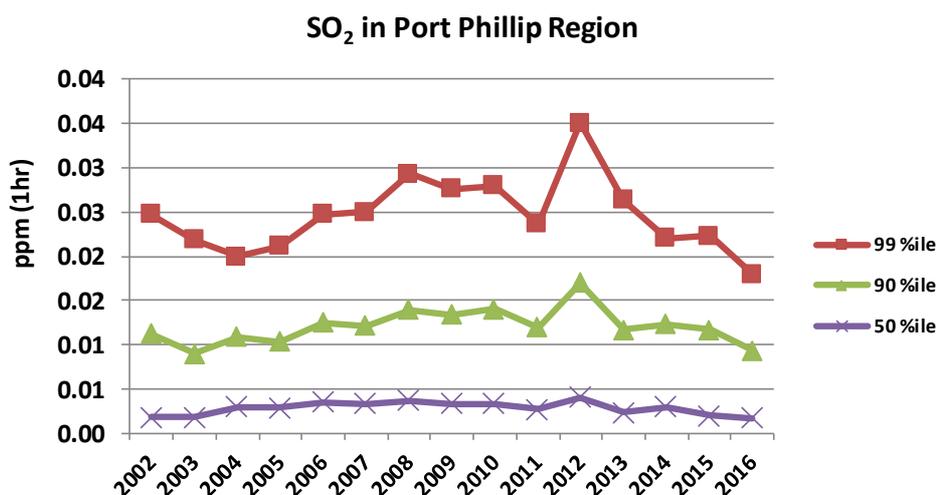


Figure 8: Percentiles of daily maximum one-hour sulfur dioxide (average of Port Phillip stations 2002–2016)

Table 52: Percentiles of daily maximum one-hour sulfur dioxide at Alphington (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	99 <sup>th</sup> (ppm)	98 <sup>th</sup> (ppm)	95 <sup>th</sup> (ppm)	90 <sup>th</sup> (ppm)	70 <sup>th</sup> (ppm)	50 <sup>th</sup> (ppm)
2002	98.4	0	0.012	0.008	0.007	0.006	0.004	0.002	0.000
2003	96.7	0	0.021	0.007	0.006	0.004	0.003	0.002	0.001
2004	99.7	0	0.014	0.009	0.007	0.005	0.004	0.003	0.001
2005	94.5	0	0.011	0.008	0.007	0.005	0.004	0.002	0.001
2006	90.7	0	0.013	0.011	0.009	0.008	0.006	0.004	0.002
2007	99.5	0	0.022	0.010	0.008	0.006	0.005	0.004	0.002
2008	98.4	0	0.014	0.010	0.009	0.006	0.005	0.003	0.002
2009	97.5	0	0.012	0.009	0.008	0.006	0.005	0.002	0.001
2010	95.6	0	0.008	0.007	0.007	0.005	0.004	0.002	0.001
2011	94.2	0	0.011	0.007	0.006	0.004	0.004	0.002	0.001
2012 <sup>a</sup>	33.1	0	<i>0.014</i>	<i>0.011</i>	<i>0.009</i>	<i>0.006</i>	<i>0.004</i>	<i>0.003</i>	<i>0.002</i>
2013	79.7	0	0.035	0.010	0.007	0.005	0.004	0.003	0.001
2014	90.1	0	0.011	0.010	0.009	0.007	0.005	0.003	0.002
2015	86.6	0	0.012	0.009	0.007	0.006	0.004	0.003	0.001
2016	92.1	0	0.009	0.008	0.007	0.005	0.004	0.002	0.001

a: data availability between 15 and 75 per cent, values displayed in italics

Table 53: Percentiles of daily maximum one-hour sulfur dioxide at Altona (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	99 <sup>th</sup> (ppm)	98 <sup>th</sup> (ppm)	95 <sup>th</sup> (ppm)	90 <sup>th</sup> (ppm)	70 <sup>th</sup> (ppm)	50 <sup>th</sup> (ppm)
2002	97.3	0	0.122	0.045	0.037	0.024	0.019	0.010	0.004
2003	94.8	0	0.036	0.032	0.027	0.020	0.014	0.007	0.003
2004	97.5	0	0.044	0.028	0.026	0.021	0.017	0.010	0.005
2005	96.2	0	0.044	0.032	0.028	0.021	0.018	0.009	0.005
2006	92.3	0	0.053	0.039	0.031	0.024	0.020	0.011	0.005
2007	97.3	0	0.039	0.032	0.029	0.023	0.018	0.010	0.005
2008	98.9	0	0.059	0.046	0.038	0.029	0.023	0.011	0.006
2009	97.0	0	0.061	0.048	0.040	0.031	0.024	0.012	0.006
2010	92.1	0	0.068	0.049	0.040	0.032	0.025	0.012	0.006
2011	98.4	0	0.047	0.034	0.030	0.023	0.017	0.008	0.004
2012	96.2	0	0.066	0.043	0.033	0.026	0.021	0.012	0.005
2013	97.0	0	0.052	0.042	0.036	0.025	0.019	0.008	0.004
2014	99.7	0	0.041	0.033	0.031	0.027	0.023	0.012	0.005
2015	98.4	0	0.062	0.041	0.039	0.031	0.025	0.011	0.004
2016	75.4	0	0.044	0.039	0.033	0.024	0.020	0.008	0.003

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Table 54: Percentiles of daily maximum one-hour sulfur dioxide at Geelong (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	84.9	0	0.040	0.029	0.024	0.016	0.012	0.005	0.001
2003	96.2	0	0.039	0.032	0.026	0.015	0.011	0.005	0.001
2004	90.7	0	0.069	0.026	0.023	0.019	0.013	0.007	0.003
2005	96.4	0	0.054	0.029	0.022	0.017	0.012	0.008	0.003
2006	93.2	0	0.036	0.029	0.026	0.017	0.013	0.007	0.003
2007	98.9	0	0.083	0.033	0.027	0.017	0.013	0.008	0.003
2008	96.7	0	0.050	0.032	0.024	0.016	0.014	0.007	0.003
2009	98.9	0	0.037	0.026	0.024	0.017	0.012	0.007	0.003
2010	92.6	0	0.052	0.028	0.025	0.019	0.013	0.007	0.003
2011	97.5	0	0.033	0.029	0.027	0.017	0.015	0.008	0.003
2012	97.8	0	0.060	0.027	0.021	0.015	0.013	0.007	0.003
2013	97.3	0	0.029	0.027	0.023	0.015	0.012	0.006	0.002
2014	87.4	0	0.029	0.023	0.017	0.012	0.009	0.005	0.002
2015	98.6	0	0.026	0.017	0.014	0.010	0.006	0.003	0.001
2016	97.3	0	0.010	0.007	0.006	0.005	0.004	0.002	0.001

Table 55: Percentiles of daily maximum one-hour sulfur dioxide at Traralgon (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	96.7	0	0.062	0.032	0.022	0.016	0.012	0.008	0.005
2003	97.5	0	0.082	0.038	0.030	0.020	0.015	0.009	0.005
2004	98.4	0	0.079	0.042	0.030	0.018	0.013	0.008	0.005
2005	91.5	0	0.061	0.044	0.034	0.022	0.015	0.009	0.005
2006	97.5	0	0.095	0.037	0.033	0.022	0.017	0.010	0.006
2007	96.2	0	0.092	0.041	0.029	0.022	0.016	0.011	0.006
2008	97.8	0	0.170	0.042	0.032	0.018	0.013	0.009	0.005
2009	99.5	0	0.110	0.040	0.030	0.019	0.013	0.008	0.004
2010	100.0	0	0.049	0.028	0.021	0.012	0.009	0.006	0.003
2011	99.5	0	0.038	0.019	0.016	0.013	0.009	0.006	0.003
2012	99.7	0	0.101	0.023	0.017	0.013	0.010	0.005	0.003
2013	92.1	0	0.070	0.028	0.025	0.014	0.009	0.005	0.003
2014	85.8	0	0.044	0.036	0.029	0.015	0.009	0.006	0.003
2015	96.4	0	0.061	0.023	0.020	0.013	0.010	0.006	0.003
2016	88.5	0.057	0.057	0.023	0.017	0.014	0.010	0.006	0.003

Table 56: Percentiles of daily sulfur dioxide at Alphington (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	98.4	0	0.002	0.001	0.001	0.000	0.000	0.000	-0.001
2003	96.7	0	0.002	0.002	0.001	0.001	0.001	0.000	0.000
2004	99.7	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000
2005	94.5	0	0.002	0.002	0.002	0.001	0.001	0.001	0.000
2006	90.7	0	0.004	0.003	0.003	0.002	0.002	0.001	0.001
2007	99.5	0	0.004	0.003	0.003	0.002	0.002	0.001	0.001
2008	98.4	0	0.005	0.003	0.002	0.002	0.002	0.001	0.001
2009	97.5	0	0.003	0.002	0.002	0.002	0.001	0.000	-0.001
2010	95.6	0	0.004	0.002	0.001	0.001	0.001	0.000	-0.001
2011	94.2	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000
2012	33.1	0	0.003	0.003	0.002	0.002	0.001	0.001	0.000
2013	79.7	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000
2014	89.9	0	0.004	0.003	0.002	0.002	0.001	0.001	0.000
2015	86.6	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000
2016	92.1	0	0.002	0.002	0.002	0.001	0.001	0.001	0.000

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Table 57: Percentiles of daily sulfur dioxide at Altona (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	97.3	0	0.019	0.008	0.008	0.005	0.003	0.001	0.001
2003	94.8	0	0.009	0.007	0.005	0.003	0.002	0.001	0.000
2004	97.5	0	0.013	0.008	0.006	0.005	0.003	0.002	0.001
2005	96.2	0	0.010	0.007	0.006	0.004	0.003	0.002	0.001
2006	92.3	0	0.019	0.009	0.006	0.004	0.003	0.002	0.001
2007	97.3	0	0.013	0.008	0.006	0.004	0.003	0.002	0.001
2008	98.9	0	0.015	0.009	0.007	0.006	0.004	0.002	0.001
2009	97.0	0	0.034	0.011	0.009	0.006	0.005	0.003	0.001
2010	92.1	0	0.026	0.012	0.009	0.006	0.004	0.003	0.001
2011	98.4	0	0.012	0.009	0.007	0.005	0.003	0.002	0.001
2012	96.2	0	0.018	0.010	0.008	0.005	0.004	0.002	0.001
2013	97.0	0	0.009	0.007	0.006	0.005	0.003	0.002	0.001
2014	99.5	0	0.011	0.009	0.007	0.006	0.004	0.002	0.001
2015	98.4	0	0.018	0.012	0.010	0.005	0.003	0.002	0.001
2016	75.4	0	0.013	0.008	0.006	0.004	0.003	0.002	0.001

Table 58: Percentiles of daily sulfur dioxide at Geelong (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	84.9	0	0.004	0.002	0.002	0.001	0.001	0.000	-0.001
2003	96.2	0	0.004	0.003	0.002	0.002	0.001	0.000	-0.001
2004	90.7	0	0.006	0.004	0.003	0.002	0.002	0.001	0.000
2005	96.4	0	0.008	0.005	0.004	0.003	0.002	0.001	0.001
2006	93.2	0	0.005	0.005	0.004	0.003	0.002	0.001	0.001
2007	98.9	0	0.009	0.004	0.003	0.003	0.002	0.001	0.001
2008	96.7	0	0.007	0.004	0.004	0.003	0.002	0.001	0.001
2009	98.9	0	0.006	0.004	0.003	0.003	0.002	0.001	0.001
2010	92.6	0	0.007	0.004	0.004	0.003	0.002	0.001	0.001
2011	97.5	0	0.005	0.004	0.004	0.004	0.003	0.002	0.001
2012	97.8	0	0.006	0.004	0.004	0.003	0.002	0.001	0.001
2013	97.3	0	0.005	0.003	0.003	0.003	0.002	0.001	0.000
2014	87.1	0	0.005	0.004	0.003	0.002	0.001	0.001	0.000
2015	98.6	0	0.003	0.003	0.002	0.002	0.001	0.001	0.000
2016	97.3	0	0.002	0.002	0.002	0.001	0.001	0.000	0.000

Table 59: Percentiles of daily sulfur dioxide at Traralgon (2002-2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	96.7	0	0.009	0.008	0.005	0.004	0.004	0.003	0.002
2003	97.5	0	0.008	0.006	0.005	0.005	0.004	0.002	0.001
2004	98.4	0	0.010	0.007	0.006	0.004	0.003	0.002	0.001
2005	91.5	0	0.012	0.007	0.005	0.004	0.003	0.002	0.001
2006	97.5	0	0.023	0.007	0.006	0.005	0.004	0.003	0.002
2007	95.6	0	0.011	0.009	0.008	0.006	0.005	0.003	0.002
2008	97.8	0	0.026	0.008	0.007	0.005	0.004	0.003	0.002
2009	99.5	0	0.013	0.008	0.006	0.005	0.004	0.003	0.002
2010	100.0	0	0.007	0.005	0.004	0.003	0.003	0.002	0.001
2011	99.5	0	0.005	0.004	0.004	0.003	0.003	0.002	0.001
2012	99.7	0	0.015	0.005	0.004	0.004	0.003	0.002	0.002
2013	92.1	0	0.007	0.005	0.004	0.003	0.002	0.001	0.001
2014	85.8	0	0.010	0.005	0.004	0.003	0.002	0.001	0.001
2015	96.4	0	0.007	0.005	0.003	0.003	0.002	0.001	0.001
2016	88.5	0	0.006	0.005	0.004	0.003	0.002	0.001	0.001

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## H Particulate matter less than 10 µm (PM<sub>10</sub>)

### Assessment of compliance with standards and goals of the Measure for PM<sub>10</sub>

In Victoria, PM<sub>10</sub> is assessed against a daily standard of 50 µg/m<sup>3</sup>, with zero exceedance days allowed per year. PM<sub>10</sub> is also assessed against an annual standard of 25 µg/m<sup>3</sup>.

Table 60: 2016 compliance summary for daily PM<sub>10</sub> in Victoria

Region	Data availability rates (% of hours)					Number of exceedances (days)	Annual average <sup>a</sup> (µg/m <sup>3</sup> )	Performance against the standard and goals
	Performance monitoring station	Q1	Q2	Q3	Q4			
<b>Port Phillip</b>								
Alphington	100.0	95.6	14.1	91.3	75.1	0	15	Met
Dandenong	100.0	98.9	89.1	94.6	95.6	0	14.6	Met
Footscray	100.0	95.6	96.7	83.7	94.0	0	14.1	Met
Geelong South	97.8	90.1	87.0	98.9	93.4	5	15.9	ND
Mooroolbark	97.8	98.9	95.7	92.4	96.2	0	12.5	Met
Richmond	35.2	0.0	0.0	0.0	8.7	0	12.5	ND
<b>Latrobe Valley</b>								
Traralgon	100.0	97.8	96.7	98.9	98.4	0	14	Met

ND: not demonstrated

Table 61: 2016 summary statistics for daily PM<sub>10</sub> in Victoria

Region Performance monitoring station	Number of valid days	Highest reading (µg/m <sup>3</sup> )	Highest reading (date: hour)	2nd highest reading (µg/m <sup>3</sup> )	2nd highest reading (date:hour)
<b>Port Phillip</b>					
Alphington	275	37.9	Jan 13	37.1	Apr 05
Dandenong	350	41.8	Feb 23	39.3	Jan 25
Footscray	344	42.7	Apr 04	41	Feb 23
Geelong South	342	68.3	May 03	67.3	Apr 05
Mooroolbark	352	44.7	Apr 05	36.1	Feb 27
Richmond	32	32	Jan 13	27.8	Jan 26
<b>Latrobe Valley</b>					
Traralgon	360	49.2	Apr 28	39.0	Apr 20

The highest daily average for PM<sub>10</sub> in the Port Phillip region, at Geelong South was 136.6 per cent of the standard. The high levels of localised dust have been attributed to an unsealed carpark and high levels of vehicle movement associated with the Geelong races. The highest daily average for PM<sub>10</sub> in the Latrobe Valley, at Traralgon was 98.4 per cent of the standard. The highest annual average for PM<sub>10</sub> in the Port Phillip region, at Geelong South was 63.6 per cent of the standard and in the Latrobe Valley, at Traralgon, 56 per cent of the standard.

Table 62: 2016 PM<sub>10</sub> exceedances

Date	Port Phillip <sup>b</sup>							Latrobe Valley	Inferred cause <sup>a</sup>
	Alphington	Brighton	Dandenong	Footscray	Geelong South	Mooroolbark	Richmond	Traralgon	
March 06	15.7		16.6	15.9	52.9	22.4		15.7	local dust
April 01	27.5		31.7	25.6	63.0	33.3		23.7	local dust
April 05	37.1		39	39.5	67.3	44.7		38.1	local dust and planned burns <sup>c</sup>
May 03	21.5		17.0	14.6	68.3	13.6		12.7	local dust
December 13	34.4		25.4	35.1	59.7	20.8		19.9	local dust

a: Inferred causes include windborne crustal dust, often from distant sources (dust), smoke from bushfires, planned burning or agricultural burning and particles accumulating in stable atmospheric conditions, typically from motor vehicles or domestic wood heaters (urban).

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b: Exceedances are highlighted in red, concentrations of other stations are included to show the distribution across the network.  
 c: Considered to be an exceptional event as per the definition of exceptional event in the Measure.

Table 63: 2016 percentiles for daily PM<sub>10</sub> concentrations in Victoria

Region	Performance monitoring station	Data availability	Max (µg/m <sup>3</sup> )	Percentiles					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>									
Alphington		75.3	37.9	35.0	32.6	28.4	25.3	20.3	15.0
Brighton									
Dandenong		95.9	41.8	37.1	33.9	30.2	26.3	20.0	14.6
Footscray		94.2	42.7	37.9	35.1	29.3	25.9	20.2	14.1
Geelong South		93.7	68.3	56.9	47.3	36.8	30.4	21.9	15.9
Mooroolbark		96.4	44.7	32.4	29.7	26.3	22.4	17.4	12.5
Richmond		8.8							
<b>Latrobe Valley</b>									
Traralgon		98.6	49.2	36.0	30.2	25.4	21.8	17.4	14.0

## Trends and pollutant distributions for PM<sub>10</sub> between 2002 and 2016

Results and further analysis of the monitoring data are presented in this section. Percentiles of 2016 daily peak concentrations are provided for each station and standard. In these tables, daily peak values are formed only when at least 75 per cent of the data for the day are valid. Data for stations with less than 15 per cent data in the year are omitted and stations with less than 75 per cent data are shown in italics. Exceedances are shown in bold. The percentiles for eight-hour carbon monoxide and four-hour ozone are based on running averages, including those that overlap from one day to the next.

Percentiles of the daily peak concentrations in Port Phillip Region are plotted from 2002, when monitoring according to the Measure's protocol ensured greater continuity of stations operating each year. The values plotted are averages of the percentiles from stations having at least 75 per cent of data in the year. Different stations and different statistics can suggest different trend behaviour; no estimates of statistical significance are presented.

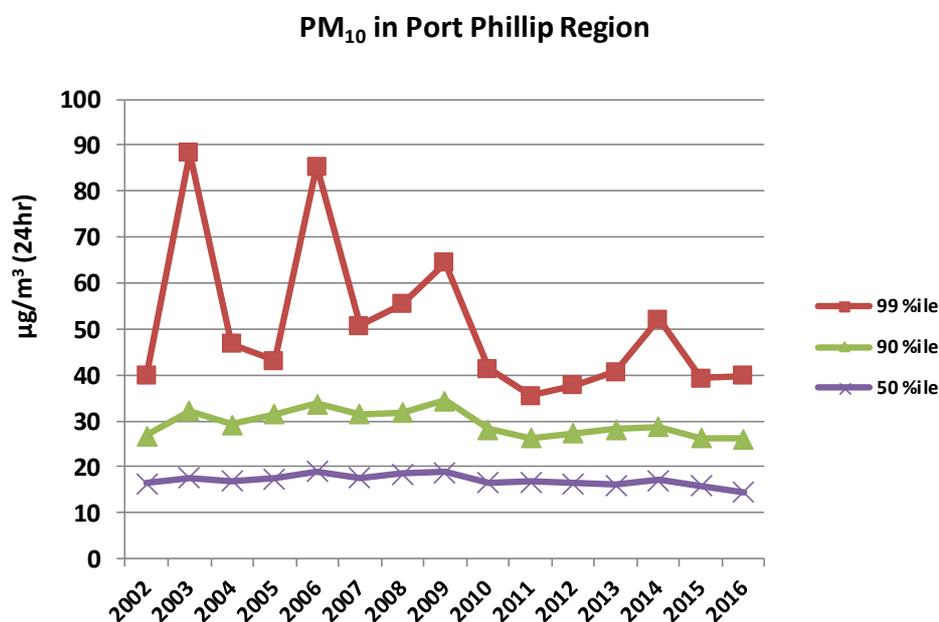


Figure 9: Percentiles of daily PM<sub>10</sub> (average of Port Phillip stations 2002–2016)

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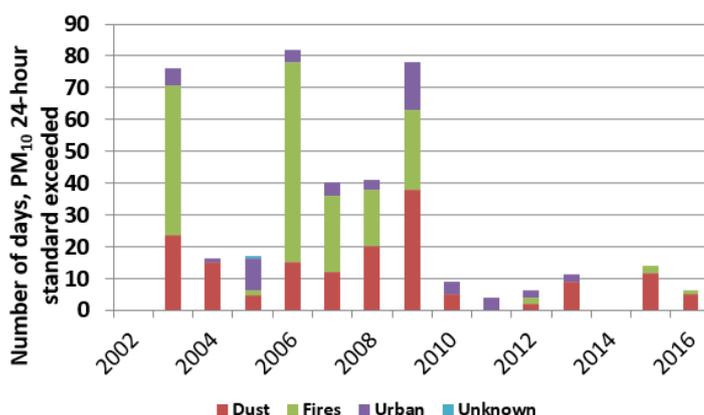


Figure 10: Inferred causes of exceedances of the PM<sub>10</sub> standard (Port Phillip region 2002-2016)

In 2016, PM<sub>10</sub> exceedances at Geelong South (five days) were due to non-continental scale windblown dust, and one due to jurisdiction authorised hazard reduction burns (that is, planned burns). The bushfires and jurisdiction authorised hazard reduction burns are considered exceptional events under the Measure.

The elevated particle levels above the air quality standard were mainly attributed (see Figure 10) to fires (bushfires and planned burning), followed by windborne dust (either locally stable atmospheric conditions contribute to a lesser extent to these peaks. The raised dust or dust storms with transport over larger distances). Analysis of when these events occur indicates that urban emissions i.e. particles typically from motor vehicles or domestic wood heaters accumulating in years 2003, 2006 and 2009 were particularly affected by fires, with no station in the Port Phillip region meeting the goal. In other years, most stations in the region met the goal.

The major cause of the elevated particle levels was mainly attributed to fire – bushfires and planned burning – followed by windborne dust (either locally raised dust or dust storms with transport over larger distances).

Table 64: Percentiles of daily PM<sub>10</sub> at Alphington (2002–2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	97.5	1	66.2	35.9	34.5	30.4	27.9	22.4	17.2
2003 <sup>a</sup>	95.9	<b>10</b>	181.7	80.9	56.4	38.3	30.9	22.9	17.2
2004	97.0	1	51.6	45.2	36.8	30.9	27.6	22.0	16.5
2005	92.6	0	46.6	40.7	36.8	34.5	31.4	23.3	17.0
2006 <sup>a</sup>	87.1	<b>8</b>	154.7	82.5	58.4	40.0	31.3	23.9	18.4
2007	100.0	2	83.1	43.5	40.4	35.2	30.8	22.8	17.6
2008	99.5	3	71.1	45.2	40.0	34.8	29.1	23.5	17.8
2009 <sup>a</sup>	98.1	<b>7</b>	140.8	58.9	49.6	39.8	31.5	25.3	18.5
2010	97.8	0	47.7	37.7	35.2	31.3	27.6	22.9	17.7
2011	97.0	1	50.3	31.7	31.1	26.3	23.6	19.5	15.6
2012	97.8	0	40.7	30.8	29.5	26.3	23.7	19.4	15.1
2013	98.9	0	44.3	35.5	32.7	29.2	25.1	19.9	15.1
2014	96.2	4	64.5	45.9	33.4	30.7	24.6	20.4	16.3
2015	92.9	0	<b>108.0<sup>b</sup></b>	38.4	33.3	27.5	24.7	20.0	15.3
2016	75.3	0	37.9	35.0	32.6	28.4	25.3	20.3	15.0

a: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in bold

b: Recorded on a day with less than 25 per cent data capture, not included in count of exceedances days

Table 65: Percentiles of daily PM<sub>10</sub> at Brighton (2002–2015)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	97.3	1	69.1	34.7	31.1	28.2	24.8	19.6	14.7
2003 <sup>b</sup>	88.8	<b>8</b>	182.3	89.3	67.8	35.9	30.5	21.5	15.8
2004	89.3	0	44.9	40.5	36.6	30.4	26.4	20.9	15.9
2005	84.1	0	41.5	33.8	32.7	28.0	25.8	19.7	14.4
2006 <sup>b</sup>	89.9	<b>6</b>	109.1	78.0	46.2	36.7	25.9	19.8	13.8
2007	99.7	1	78.4	35.9	32.7	29.4	24.1	18.1	13.7
2008	100.0	5	65.3	52.5	43.8	33.4	26.7	21.8	16.1

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Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2009 <sup>b</sup>	99.5	6	132.4	57.1	48.5	35.7	29.1	22.8	17.1
2010 <sup>a</sup>	17.0	0	47.6	37.9	31.1	27.7	23.8	21.1	17.2
2011	98.6	0	41.9	30.0	28.9	26.2	24.4	19.8	15.5
2012	98.6	0	45.8	31.8	30.7	27.5	24.8	20.1	15.5
2013	97.8	0	36.3	33.3	31.0	28.4	24.7	20.0	15.2
2014	97.3	2	58.1	38.1	36.1	29.6	25.6	20.1	16.0
2015 <sup>a</sup>	17.0	0	47.6	37.9	31.1	27.7	23.8	21.1	17.2

a: data availability between 15 and 75 per cent, values displayed in italics.

b: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**

Note: Monitoring ceased in 2015

Table 66: Percentiles of daily PM<sub>10</sub> at Dandenong (2002–2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	87.4	3	84.8	45.6	37.6	31.5	26.5	21.0	15.8
2003 <sup>b</sup>	93.4	8	295.1	92.3	52.4	39.0	30.9	23.4	17.6
2004	92.3	1	50.1	44.5	42.1	35.7	30.8	23.4	16.7
2005	90.1	0	43.7	40.5	37.5	34.0	31.5	24.8	17.4
2006 <sup>b</sup>	100.0	12	149.2	90.9	71.3	47.5	38.2	30.0	22.8
2007	100.0	5	84.6	52.3	47.3	39.4	35.0	27.4	19.1
2008 <sup>b</sup>	99.2	8	88.6	61.3	52.8	39.4	33.2	25.4	19.1
2009 <sup>b</sup>	94.2	12	199.7	63.7	54.8	43.3	36.8	26.0	18.7
2010	98.6	0	43.7	38.6	36.0	31.8	27.4	21.8	15.8
2011	99.5	0	43.5	34.5	30.7	28.9	26.6	21.5	17.4
2012	98.6	0	49.8	39.7	35.4	30.8	27.8	22.1	16.9
2013	93.4	1	52.9	38.1	36.6	33.7	30.2	23.6	17.3
2014	99.2	4	68.6	53.0	40.8	35.1	29.3	23.0	17.9
2015 <sup>a</sup>	69.9	0	47.8	41.9	38.1	32.9	26.5	22.6	17.5
2016	95.9	0	41.8	37.1	33.9	30.2	26.3	20.0	14.6

a: data availability between 15 and 75 per cent, values displayed in italics

b: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**

Table 67: Percentiles of daily PM<sub>10</sub> at Footscray (2002–2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	98.4	2	79.1	42.9	38.7	32.2	28.3	22.1	17.5
2003 <sup>a</sup>	87.7	10	314.5	89.1	66.0	41.0	32.2	23.4	17.6
2004	93.2	3	58.1	48.4	40.4	33.5	29.1	22.3	16.1
2005	96.4	0	48.9	44.7	41.3	37.4	35.0	26.0	18.9
2006 <sup>a</sup>	90.1	11	124.5	77.0	55.9	41.0	35.5	25.8	19.5
2007	99.5	4	65.9	49.8	42.2	38.6	32.2	24.4	17.8
2008	100.0	4	89.3	48.6	46.0	42.0	33.1	25.8	19.2
2009 <sup>a</sup>	98.9	13	166.5	67.9	58.5	43.5	34.8	27.0	18.7
2010	99.2	4	74.8	50.8	41.3	35.4	29.3	23.2	17.4
2011	98.9	0	49.6	36.6	34.4	30.4	27.9	23.0	17.9
2012	98.9	3	57.7	45.1	38.7	33.7	28.6	23.6	17.1
2013	97.3	2	50.5	43.0	38.9	34.4	28.8	22.5	16.6
2014 <sup>a</sup>	98.6	6	79.2	63.0	42.2	36.5	30.6	23.0	18.0
2015 <sup>a</sup>	97.0	3	71.8	44.7	35.7	32.5	28.8	21.9	16.4
2016	94.2	0	42.7	37.9	35.1	29.3	25.9	20.2	14.1

a: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**

Table 68: Percentiles of daily PM<sub>10</sub> at Geelong (2002–2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002 <sup>ab</sup>	32.1	6	81.1	73.2	56.8	49.5	35.8	27.4	20.1
2003 <sup>b</sup>	94.0	10	148.7	80.2	57.7	45.3	35.3	25.6	18.4
2004 <sup>b</sup>	91.8	11	149.0	62.5	53.5	44.0	34.3	26.1	18.3
2005 <sup>b</sup>	96.2	7	83.0	55.2	49.3	40.6	33.7	26.6	18.5
2006 <sup>b</sup>	91.0	17	116.4	98.0	72.2	49.1	38.0	26.9	19.6

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Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2007 <sup>b</sup>	98.9	14	129.1	65.2	59.9	43.4	32.8	26.5	19.1
2008 <sup>b</sup>	99.7	6	168.7	66.6	48.8	39.4	35.4	26.4	18.9
2009 <sup>b</sup>	85.2	12	154.6	65.4	57.3	46.2	36.6	27.8	20.1
2010	99.5	1	50.4	44.6	42.3	34.0	29.6	22.2	16.5
2011	98.9	2	57.4	46.2	43.8	35.1	29.4	23.2	17.7
2012	98.1	1	53.8	42.7	38.7	34.9	29.8	23.6	16.9
2013 <sup>b</sup>	99.5	8	107.6	60.7	52.4	40.6	33.3	24.8	16.5
2014 <sup>b</sup>	99.5	8	75.8	58.8	51.7	43.3	33.8	24.3	17.7
2015 <sup>b</sup>	79.7	10	286.1	84.4	64.1	45.5	32.4	23.8	16.6
2016 <sup>b</sup>	93.7	5	68.3	56.9	47.3	36.8	30.4	21.9	15.9

a: data availability between 15 and 75 per cent, values displayed in *italics*

b: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**

Table 69: Percentiles of daily PM<sub>10</sub> at Mooroolbark (2002–2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002 <sup>ab</sup>	<i>57</i>	1	66.7	44.9	44.3	39.7	33.2	27.0	19.9
2003 <sup>b</sup>	91.8	13	322.2	118.1	91.3	45.6	37.4	26.8	19.1
2004 <sup>b</sup>	94.8	1	63.9	46.0	42.8	34.7	30.1	23.9	17.3
2005 <sup>b</sup>	99.5	9	57.6	53.7	52.1	43.1	36.1	27.4	19.3
2006 <sup>b</sup>	97.3	17	219.9	135.9	69.6	46.1	39.2	29.1	21.3
2007 <sup>b</sup>	100.0	11	136.1	63.0	51.7	43.0	37.3	27.4	19.4
2008 <sup>b</sup>	97.8	10	99.9	60.6	54.7	44.5	37.8	27.7	21.1
2009 <sup>b</sup>	98.1	20	214.1	82.3	67.5	50.7	41.6	28.6	20.7
2010	94.0	3	53.8	48.1	43.9	36.5	32.3	25.6	17.6
2011	99.2	1	50.1	36.2	35.6	31.7	27.4	21.7	17.0
2012	99.2	2	53.9	40.8	38.2	34.0	31.2	23.7	17.6
2013	98.4	0	42.6	39.7	37.9	34.9	30.4	23.6	16.4
2014	98.4	4	109.3	55.4	40.9	34.1	30.1	23.2	17.5
2015 <sup>ab</sup>	<i>15.6</i>	0	39.5	37.5	35.5	31.8	27.2	22.0	17.5
2016	96.4	0	44.7	32.4	29.7	26.3	22.4	17.4	12.5

a: data availability between 15 and 75 per cent, values displayed in *italics*

b: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**

Table 70: Percentiles of daily PM<sub>10</sub> at Richmond (2002–2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	92.6	1	70.0	40.3	34.7	29.2	26.5	21.2	16.5
2003 <sup>a</sup>	92.3	6	274.9	73.8	48.2	33.2	29.1	21.6	16.5
2004	100.0	0	43.9	40.6	35.7	30.0	26.0	20.7	15.9
2005	96.2	1	54.9	39.0	37.0	32.0	28.9	22.5	17.1
2006 <sup>a</sup>	97.5	9	140.0	78.6	53.5	37.9	31.4	24.3	18.4
2007	94.0	3	78.7	44.8	36.6	32.5	27.9	21.0	16.3
2008	97.5	5	73.5	53.2	44.3	34.0	27.2	22.4	17.4
2009 <sup>a</sup>	95.3	8	121.2	55.2	50.3	36.7	30.0	23.5	17.8
2010	97.3	0	46.6	33.7	30.9	27.6	24.8	20.3	15.8
2011	92.3	0	42.4	33.7	32.2	28.0	24.9	20.2	15.8
2012	96.2	0	47.4	32.7	29.2	26.7	24.7	20.5	15.6
2013	98.1	0	41.5	33.8	32.4	28.3	25.2	20.8	15.6
2014	97.5	4	63.4	50.7	37.6	33.1	27.3	20.9	16.7
2015 <sup>a</sup>	96.2	1	52.4	35.7	32.8	27.7	24.9	20.8	16.4
2016 <sup>b</sup>	8								

a: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**

b: data availability less than 15 per cent, no values displayed

# Air monitoring report 2016 – Compliance with the National Environment Protection (Ambient Air Quality) Measure

Table 71: Percentiles of daily PM<sub>10</sub> at Traralgon (2002–2016)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002	15.3	0	37.1	33.2	30.0	28.8	26.4	23.5	18.7
<b>2003<sup>a</sup></b>	<b>98.1</b>	<b>7</b>	<b>237.8</b>	<b>59.3</b>	<b>47.5</b>	<b>37.2</b>	<b>27.3</b>	<b>21.6</b>	<b>16.8</b>
2004	99.7	0	44.5	34.2	31.8	29.8	25.9	20.6	15.9
2005	90.1	0	44.9	41.0	36.8	31.5	26.3	20.8	16.2
<b>2006<sup>a</sup></b>	<b>99.2</b>	<b>9</b>	<b>193.5</b>	<b>82.7</b>	<b>50.5</b>	<b>32.9</b>	<b>27.4</b>	<b>22.1</b>	<b>17.5</b>
2007	96.4	5	151.2	52.0	40.8	32.3	27.0	21.7	17.0
2008	100.0	2	64.9	42.1	39.2	33.2	27.9	22.4	17.6
2009	100.0	5	125.7	51.0	40.4	35.3	29.2	23.5	17.9
2010	100.0	3	77.6	39.5	33.4	28.1	24.4	19.4	15.6
2011	99.5	0	41.8	31.6	30.1	26.0	21.7	18.2	15.0
2012	97.8	0	35.0	29.4	27.6	24.4	21.4	18.1	14.5
2013	92.9	4	104.8	48.7	36	27.6	22.9	17.8	13.4
2014	97.5	3	84.9	47.1	41.3	32.2	26	19.9	15.3
2015	84.4	0	45.0	29.7	29.0	26.2	21.9	17.2	13.9
2016	98.6	0	49.2	36.0	30.2	25.4	21.8	17.4	14.0

a: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**

# Air monitoring report 2016 – Compliance with the National Environment Protection (Ambient Air Quality) Measure

## I Particulate Matter less than 2.5 µm (PM<sub>2.5</sub>)

### Assessment of compliance with standards and goals of the Measure for PM<sub>2.5</sub>

In Victoria, PM<sub>2.5</sub> is assessed against a one-day standard of 25 µg/m<sup>3</sup> and an annual standard of 8 µg/m<sup>3</sup>

#### Partisol method (manual sample once every three days)

Table 72: 2016 compliance summary for daily PM<sub>2.5</sub> in Victoria (Partisol)

Region Performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Annual average (µg/m <sup>3</sup> )
	Q1	Q2	Q3	Q4	Annual		
<b>Port Phillip</b>							
Alphington	100	93.3	100	100	98.4	2	7.4
Footscray	100	96.7	80	100	94.3	1	6.9

Data availability rates are based on a one-day-in-three sampling regime

Table 73: 2016 summary statistics for daily PM<sub>2.5</sub> in Victoria (Partisol)

Region Performance monitoring station	Number of valid days	Highest (µg/m <sup>3</sup> )	Highest (date)
<b>Port Phillip</b>			
Alphington	120	26.0	Jun 03
Footscray	115	27.0	Jun 03

Data availability rates are based on a one-day-in-three sampling regime

Table 74: 2016 percentiles for daily PM<sub>2.5</sub> concentrations in Victoria (Partisol)

Region Performance monitoring station	Data availability	Max (µg/m <sup>3</sup> )	Percentiles					
			99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
Alphington	98.4	26	24.1	17.6	14.1	12.1	9.4	6.2
Footscray	94.3	27	23	17.4	14.0	11.6	9.0	5.8

Data availability rates are based on a one-day-in-three sampling regime

#### Continuous equivalence methods

Victoria monitors PM<sub>2.5</sub> by the reference method specified in the Measure (on a one-day-in-three basis) at two stations (Alphington and Footscray). It also monitors PM<sub>2.5</sub> continuously at these two stations using BAM.

Table 75: 2016 compliance summary for daily PM<sub>2.5</sub> in Victoria (BAM)

Region Performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Annual average (µg/m <sup>3</sup> )
	Q1	Q2	Q3	Q4	Annual		
<b>Port Phillip</b>							
Alphington	86.7	69.2	90.2	92.4	84.7	2	7.3
Footscray	100	93.4	90.2	90.2	93.7	2	6.9
Geelong <sup>a</sup>	58.9	4.4	57.6	84.8	51.5	0	5.5
<b>Latrobe Valley</b>							
Traralgon	100	87.9	96.7	95.7	95.1	1	7.8

a: data availability between 15 and 75 per cent, values displayed in italics

Table 76: 2016 summary statistics for daily PM<sub>2.5</sub> in Victoria (BAM)

Region Performance monitoring station	Number of valid days	Highest (µg/m <sup>3</sup> )	Highest (date)
<b>Port Phillip</b>			
Alphington	309	33.6	Jun 02
Footscray	342	25.9	Jan 26
Geelong	188	15.5	Mar 08
<b>Latrobe Valley</b>			
Traralgon	348	25.7	Apr 20

The TEOM Equivalence Program ceased at Alphington and Footscray in 2012. The TEOMs were replaced by BAMs during 2014.

# Air monitoring report 2016 – Compliance with the National Environment Protection (Ambient Air Quality) Measure

The highest daily average for PM<sub>2.5</sub> in the Port Phillip region, at Alphington was 134 per cent of the standard. The highest annual average for PM<sub>2.5</sub> was recorded at Alphington and was 91.3 per cent of the standard. The highest daily average for PM<sub>2.5</sub> in the Latrobe Valley region, at Traralgon was 103 per cent of the standard. The highest annual average for PM<sub>2.5</sub> was recorded at Traralgon and was 97.5 per cent of the standard.

Table 77: 2016 PM<sub>2.5</sub> exceedances

Date	Port Phillip Region				Inferred cause
	Alphington (µg/m <sup>3</sup> )	Footscray (µg/m <sup>3</sup> )	Geelong (µg/m <sup>3</sup> )	Traralgon (µg/m <sup>3</sup> )	
Jan 26	<b>28.9<sup>b</sup></b>	<b>25.9<sup>b</sup></b>	N/A	13.8	bushfire
Apr 20	13.6	10	N/A	<b>25.7<sup>b</sup></b>	planned burns
Jun 02	<b>33.6<sup>b</sup></b>	<b>25.2<sup>b</sup></b>	N/A	6.2	urban

a: Inferred causes include smoke from bushfires, planned burning or agricultural burning and particles accumulating in stable atmospheric conditions, typically from motor vehicles or domestic wood heaters (urban).

b: Exceedances are highlighted in bold, concentrations of other stations are included to show the distribution across the network

c: Considered to be an exceptional event as per the definition of exceptional event in the Measure.

Table 78: 2016 percentiles for daily PM<sub>2.5</sub> concentrations in Victoria (BAM)

Region Performance monitoring station	Data availability	Max (µg/m <sup>3</sup> )	Percentiles					
			99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
Alphington	84.4	33.6	23.0	22.3	14.5	11.9	8.6	6.3
Footscray	93.4	25.9	19.6	14.6	12.9	11.1	8.4	6.2
Geelong <sup>a</sup>	51.4	15.5	12.6	11.6	10.0	9.0	6.8	5.3
<b>Latrobe Valley</b>								
Traralgon	95.1	25.7	22.9	20.6	15.6	12.4	9.3	6.9

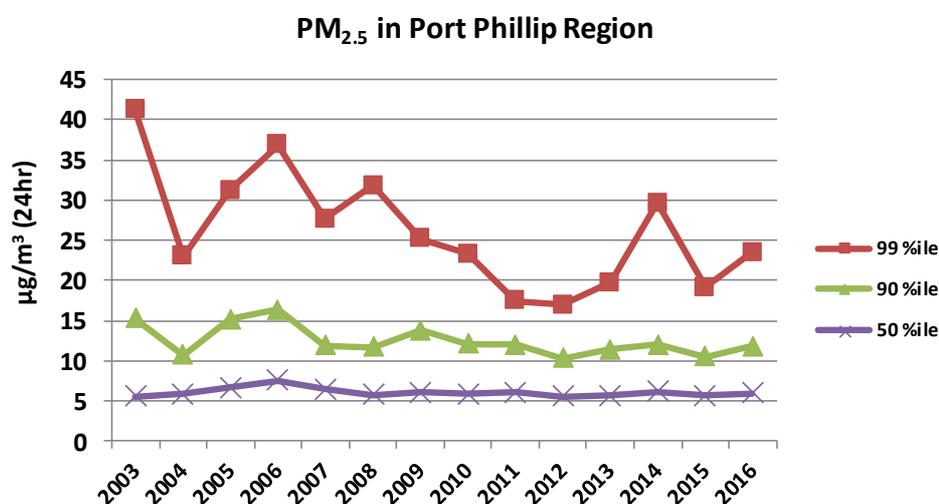
a: Insufficient data to calculate percentile, <75 per cent data capture during year, values shown are excluded from trend analysis.

## Trends and pollutant distributions for PM<sub>2.5</sub> between 2002 and 2016

Results and further analysis of the monitoring data are presented in this section. Percentiles of 2016 daily peak concentrations are provided for each station and standard. In these tables, daily peak values are formed only when at least 75 per cent of the data for the day are valid. Data for stations with less than 15 per cent data in the year are omitted and stations with less than 75 per cent data are shown in italics. Exceedances are shown in bold. The percentiles for eight-hour carbon monoxide and four-hour ozone are based on running averages, including those that overlap from one day to the next.

Percentiles of the daily peak concentrations in Port Phillip Region are plotted from 2002, when monitoring according to the Measure's protocol ensured greater continuity of stations operating each year. The values plotted are averages of the percentiles from stations having at least 75 per cent of data in the year. Different stations and different statistics can suggest different trend behaviour; no estimates of statistical significance are presented.

### Partisol method (manual sample once every three days)



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Figure 11: Percentiles of daily PM<sub>2.5</sub> (average of Port Phillip stations 2003–2016)

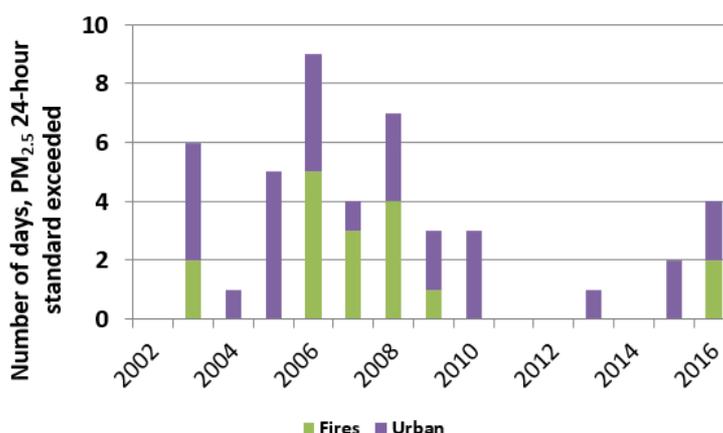


Figure 12: Inferred causes of exceedances of the PM<sub>2.5</sub> standard (Port Phillip region 2002-2016)

PM<sub>2.5</sub> is monitored using two methods as part of the network, the first is the reference Partisol method and the second is the equivalent Beta Attenuation method (BAM).

PM<sub>2.5</sub> has been monitored at two stations (Alphington and Footscray) in the Port Phillip Control Region (PPCR) since 2002 using the Partisol method. The Partisol method detected an exceedance at Alphington which was due to domestic sources such as wood heaters in winter and at Footscray during a summer bushfire event.

Continuous PM<sub>2.5</sub> has been continuously monitored at two stations (Alphington and Footscray) in the Port Phillip Control Region (PPCR) since 2014 using the Beta Attenuation method. Continuous PM<sub>2.5</sub> has been included in this report for Geelong and Traralgon using the Beta Attenuation method. The Beta Attenuation method detected an additional exceedance at Alphington during a summer bushfire event, as well as an exceedance at Traralgon related to planned burns in Autumn.

Where exceedances of the daily PM<sub>2.5</sub> standards have occurred at these stations (see Figure 12), they are attributed to urban sources, as well as bushfires and planned burns. This is based on the time of year that the event occurred, and referenced against known events.

Table 79: Percentiles of daily PM<sub>2.5</sub> at Alphington (2002-2016) Partisol

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002 <sup>a</sup>	33.6	0	19.3	17.9	16.6	11.6	11.0	8.7	6.0
2003	91.8	5	41.0	39.0	34.2	19.2	15.5	9.1	6.0
2004	94.3	1	27.4	24.2	19.4	13.0	11.3	8.6	6.0
2005	94.3	3	38.3	31.2	27.0	19.5	16.8	9.3	7.2
2006	86.9	6	56.4	36.9	31.0	25.4	16.4	10.7	7.6
2007	95.1	3	36.0	30.7	24.7	17.1	12.6	8.9	6.5
2008	100.0	4	46.7	34.5	32.2	15.8	11.6	8.6	6.0
2009	100.0	2	27.0	26.4	24.1	21.2	15.0	9.1	6.6
2010	100.0	3	27.0	26.3	22.9	15.8	12.5	8.7	6.1
2011	95.9	0	21.2	18.4	17.4	15.7	12.7	8.9	6.3
2012	98.4	0	19.0	17.6	15.2	13.8	10.6	7.8	5.7
2013	97.5	1	26.4	22.8	17.2	14.4	12.0	8.6	5.8
2014	97.5	5	40.6	32.4	23.8	16.5	12.7	8.7	6.4
2015	100	0	20.7	19.3	18.2	13.4	10.6	7.9	5.8
2016	98.4	2	26	24.1	17.6	14.1	12.1	9.4	6.2

a: data availability between 15 and 75 per cent, values displayed in italics

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Table 80: Percentiles of daily PM<sub>2.5</sub> at Footscray (2002-2016) Partisol

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
<i>2002<sup>a</sup></i>	<i>22.1</i>	<i>0</i>	<i>10.2</i>	<i>10.2</i>	<i>10.1</i>	<i>9.6</i>	<i>8.3</i>	<i>7.2</i>	<i>4.2</i>
<b>2003</b>	<b>80.3</b>	<b>3</b>	<b>55.7</b>	<b>43.5</b>	<b>29.2</b>	<b>22.5</b>	<b>15.0</b>	<b>8.4</b>	<b>5.1</b>
<b>2004</b>	<b>89.3</b>	<b>0</b>	<b>22.3</b>	<b>21.8</b>	<b>19.7</b>	<b>13.9</b>	<b>10.2</b>	<b>7.5</b>	<b>5.7</b>
<b>2005</b>	<b>81.1</b>	<b>2</b>	<b>32.8</b>	<b>31.2</b>	<b>21.3</b>	<b>16.8</b>	<b>13.5</b>	<b>9.0</b>	<b>6.1</b>
<b>2006</b>	<b>65.6</b>	<b>2</b>	<b>36.7</b>	<b>31.4</b>	<b>22.5</b>	<b>16.6</b>	<b>14.3</b>	<b>9.4</b>	<b>6.1</b>
<b>2007</b>	<b>95.1</b>	<b>1</b>	<b>33.1</b>	<b>24.7</b>	<b>22.4</b>	<b>17.0</b>	<b>11.3</b>	<b>8.5</b>	<b>6.4</b>
<b>2008</b>	<b>92.6</b>	<b>3</b>	<b>30.5</b>	<b>29.2</b>	<b>23.9</b>	<b>13.9</b>	<b>11.9</b>	<b>7.9</b>	<b>5.5</b>
<b>2009</b>	<b>92.6</b>	<b>1</b>	<b>26.9</b>	<b>24.1</b>	<b>19.4</b>	<b>15.7</b>	<b>12.7</b>	<b>9.4</b>	<b>5.6</b>
<b>2010</b>	<b>95.9</b>	<b>0</b>	<b>24.5</b>	<b>20.2</b>	<b>18.7</b>	<b>14.1</b>	<b>11.7</b>	<b>8.5</b>	<b>5.7</b>
<b>2011</b>	<b>100.0</b>	<b>0</b>	<b>18.1</b>	<b>16.6</b>	<b>15.3</b>	<b>14.0</b>	<b>11.3</b>	<b>8.3</b>	<b>5.9</b>
<b>2012</b>	<b>100.0</b>	<b>0</b>	<b>23.1</b>	<b>16.2</b>	<b>14.9</b>	<b>11.2</b>	<b>10.0</b>	<b>7.2</b>	<b>5.5</b>
<b>2013</b>	<b>100.0</b>	<b>0</b>	<b>17.1</b>	<b>16.6</b>	<b>15.5</b>	<b>12</b>	<b>10.8</b>	<b>7.7</b>	<b>5.5</b>
<b>2014</b>	<b>100.0</b>	<b>2</b>	<b>39.1</b>	<b>26.8</b>	<b>21.9</b>	<b>17.4</b>	<b>11.4</b>	<b>7.9</b>	<b>5.9</b>
<b>2015</b>	<b>100.0</b>	<b>0</b>	<b>20.8</b>	<b>19.0</b>	<b>14.0</b>	<b>12.3</b>	<b>10.5</b>	<b>7.8</b>	<b>5.5</b>
<b>2016</b>	<b>94.3</b>	<b>2</b>	<b>27</b>	<b>23</b>	<b>17.4</b>	<b>14.0</b>	<b>11.6</b>	<b>9.0</b>	<b>5.8</b>

a: data availability between 15 and 75 per cent, values displayed in italics

## Equivalence Methods (continuous)

Victoria monitors PM<sub>2.5</sub> by the reference method specified in the Measure (on a one-day-in-three basis) at two stations (Alphington and Footscray). It also monitors PM<sub>2.5</sub> continuously at these two stations using BAM. Prior to this, Victoria also participated in the PM<sub>2.5</sub> Equivalence Program, with TEOM monitors located at Alphington and Footscray.

Table 81: Percentiles of daily PM<sub>2.5</sub> at Alphington (2002-2016) (Equivalence methods)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
<i>2002<sup>a</sup></i>	<i>95.6</i>	<i>N/A</i>	<i>16.2</i>	<i>13.9</i>	<i>12.6</i>	<i>11.5</i>	<i>9.6</i>	<i>6.5</i>	<i>4.6</i>
<i>2003<sup>a</sup></i>	<i>94.2</i>	<i>N/A</i>	<i>59.5</i>	<i>39.2</i>	<i>29.9</i>	<i>17.9</i>	<i>13.7</i>	<i>8.3</i>	<i>5.6</i>
<i>2004<sup>a</sup></i>	<i>94.8</i>	<i>N/A</i>	<i>21.7</i>	<i>15.6</i>	<i>12.3</i>	<i>10.1</i>	<i>7.8</i>	<i>6.1</i>	<i>4.3</i>
<i>2005<sup>a</sup></i>	<i>93.4</i>	<i>N/A</i>	<i>24.8</i>	<i>17.9</i>	<i>16.2</i>	<i>14.0</i>	<i>11.2</i>	<i>6.9</i>	<i>4.3</i>
<i>2006<sup>a</sup></i>	<i>87.7</i>	<i>N/A</i>	<i>112.6</i>	<i>50.5</i>	<i>28.7</i>	<i>14.9</i>	<i>11.2</i>	<i>7.6</i>	<i>4.7</i>
<i>2007<sup>a</sup></i>	<i>100.0</i>	<i>N/A</i>	<i>59.4</i>	<i>21.7</i>	<i>17.9</i>	<i>14.3</i>	<i>12.0</i>	<i>7.5</i>	<i>5.0</i>
<i>2008<sup>a</sup></i>	<i>99.5</i>	<i>N/A</i>	<i>44.2</i>	<i>25.6</i>	<i>19.0</i>	<i>12.8</i>	<i>9.9</i>	<i>6.8</i>	<i>4.7</i>
<i>2009<sup>a</sup></i>	<i>98.4</i>	<i>N/A</i>	<i>32.7</i>	<i>22.4</i>	<i>21.3</i>	<i>14.8</i>	<i>11.7</i>	<i>7.3</i>	<i>4.7</i>
<i>2010<sup>a</sup></i>	<i>98.1</i>	<i>N/A</i>	<i>17.3</i>	<i>16.1</i>	<i>14.4</i>	<i>11.1</i>	<i>9.4</i>	<i>6.2</i>	<i>4.1</i>
<i>2011<sup>a</sup></i>	<i>89.9</i>	<i>N/A</i>	<i>20.2</i>	<i>14.8</i>	<i>13.7</i>	<i>11.6</i>	<i>8.9</i>	<i>6.1</i>	<i>4.2</i>
<i>2012<sup>a</sup></i>	<i>91.5</i>	<i>N/A</i>	<i>21.1</i>	<i>13.5</i>	<i>12.3</i>	<i>9.9</i>	<i>8.2</i>	<i>5.6</i>	<i>3.6</i>
<i>2013<sup>ac</sup></i>	<i>29.0</i>	<i>N/A</i>	<i>17.4</i>	<i>12.7</i>	<i>12.1</i>	<i>11.6</i>	<i>9.2</i>	<i>6.6</i>	<i>4.2</i>
<i>2014<sup>b</sup></i>	<i>91.8</i>	<i>N/A</i>	<i>44.8</i>	<i>31.5</i>	<i>22.1</i>	<i>15.8</i>	<i>13.8</i>	<i>9.8</i>	<i>7.2</i>
<i>2015<sup>b</sup></i>	<i>79.5</i>	<i>2</i>	<i>30.0</i>	<i>24.5</i>	<i>23.3</i>	<i>19.2</i>	<i>13.3</i>	<i>10.0</i>	<i>7.3</i>
<i>2016<sup>b</sup></i>	<i>84.4</i>	<i>2</i>	<i>33.6</i>	<i>23.0</i>	<i>22.3</i>	<i>14.5</i>	<i>11.9</i>	<i>8.6</i>	<i>6.3</i>

a: Measured using a TEOM

b: Measured using a BAM

c: data availability between 15 and 75 per cent, values displayed in italics

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Table 82: Percentiles of daily PM<sub>2.5</sub> at Footscray (2002-2016) (Equivalence methods)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2002 <sup>a</sup>	65.5	N/A	24.7	21.5	19.7	16.0	13.8	10.9	8.8
2003 <sup>a</sup>	10.1	N/A	14.0	13.9	13.7	12.8	10.9	8.4	5.3
2004 <sup>a</sup>	88.5	N/A	23.8	14.1	12.5	9.9	8.2	5.8	3.8
2005 <sup>a</sup>	99.7	N/A	20.3	14.3	13.0	10.8	9.0	5.9	3.9
2006 <sup>a</sup>	91.8	N/A	95.7	44.0	23.2	15.6	11.3	6.8	4.3
2007 <sup>a</sup>	99.5	N/A	42.9	18.9	16.0	12.0	10.4	6.3	4.2
2008 <sup>a</sup>	99.7	N/A	34.5	23.2	16.6	11.6	9.2	6.6	4.5
2009 <sup>a</sup>	99.5	N/A	32.9	23.3	19.4	13.8	10.8	7.3	4.2
2010 <sup>a</sup>	98.9	N/A	22.9	15.7	12.5	10.3	8.4	5.7	3.7
2011 <sup>a</sup>	99.2	N/A	15.7	12.6	11.9	10.2	8.3	6.1	4.0
2012 <sup>a</sup>	97.3	N/A	26.3	14.8	13.1	10.4	8.0	5.5	3.7
2013 <sup>ac</sup>	29.6	N/A	17.6	15	14.5	11.5	9.7	6.4	4.4
2014 <sup>bc</sup>	25.2	N/A	18.1	13.7	13.1	11.8	10.1	8.1	6.5
2015 <sup>b</sup>	73.4	0	23.3	19.3	16.4	13.4	11.6	9.0	6.8
2016 <sup>b</sup>	93.4	2	25.9	19.6	14.6	12.9	11.1	8.4	6.2

a: Measured using a TEOM

b: Measured using a BAM

c: data availability between 15 and 75 per cent, values displayed in italics

Table 83: Percentiles of daily PM<sub>2.5</sub> at Geelong (2016) (Equivalence methods)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2016 <sup>a</sup>	51.4	0	15.5	12.6	11.6	10.0	9.0	6.8	5.3

a: data availability between 15 and 75 per cent, values displayed in italics

Table 84: Percentiles of daily PM<sub>2.5</sub> at Traralgon (2016) (Equivalence methods)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2016	95.1	1	25.7	22.9	20.6	15.6	12.4	9.3	6.9

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## J Lead (Pb)

The peak station for lead, in Collingwood, was closed in December 2004 because levels were so low compared to the air quality objective. This change to Victoria's monitoring plan was approved in accordance with procedures outlined in the Measure.

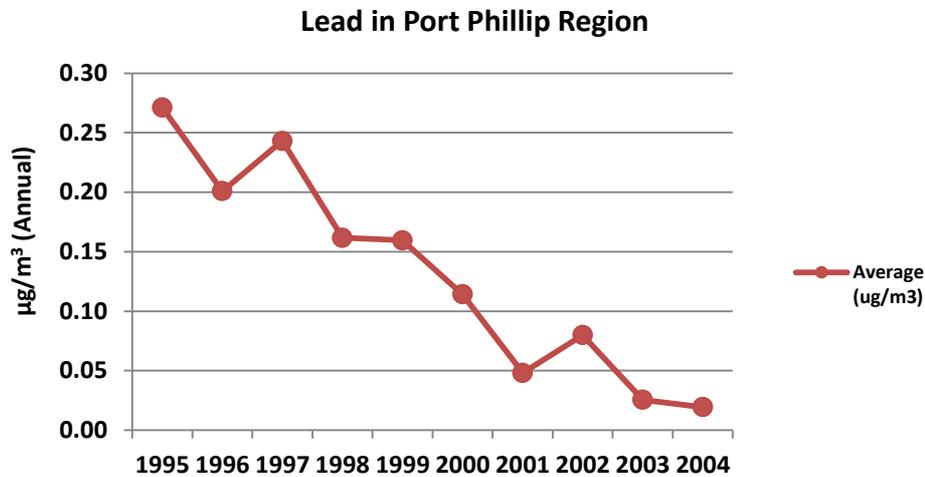


Figure 13: Historical annual averages for lead (Collingwood 1995-2004)

Table 85: Historical annual averages for lead (Collingwood 1995–2004)

Year	Data availability (% of days)	Annual Average (µg/m <sup>3</sup> )
1995	80.5	0.27
1996	100.0	0.20
1997	100.0	0.24
1998	90.4	0.16
1999	98.6	0.16
2000	100.0	0.11
2001	92.1	0.05
2002	92.1	0.08
2003	98.6	0.03
2004	91.8	0.02